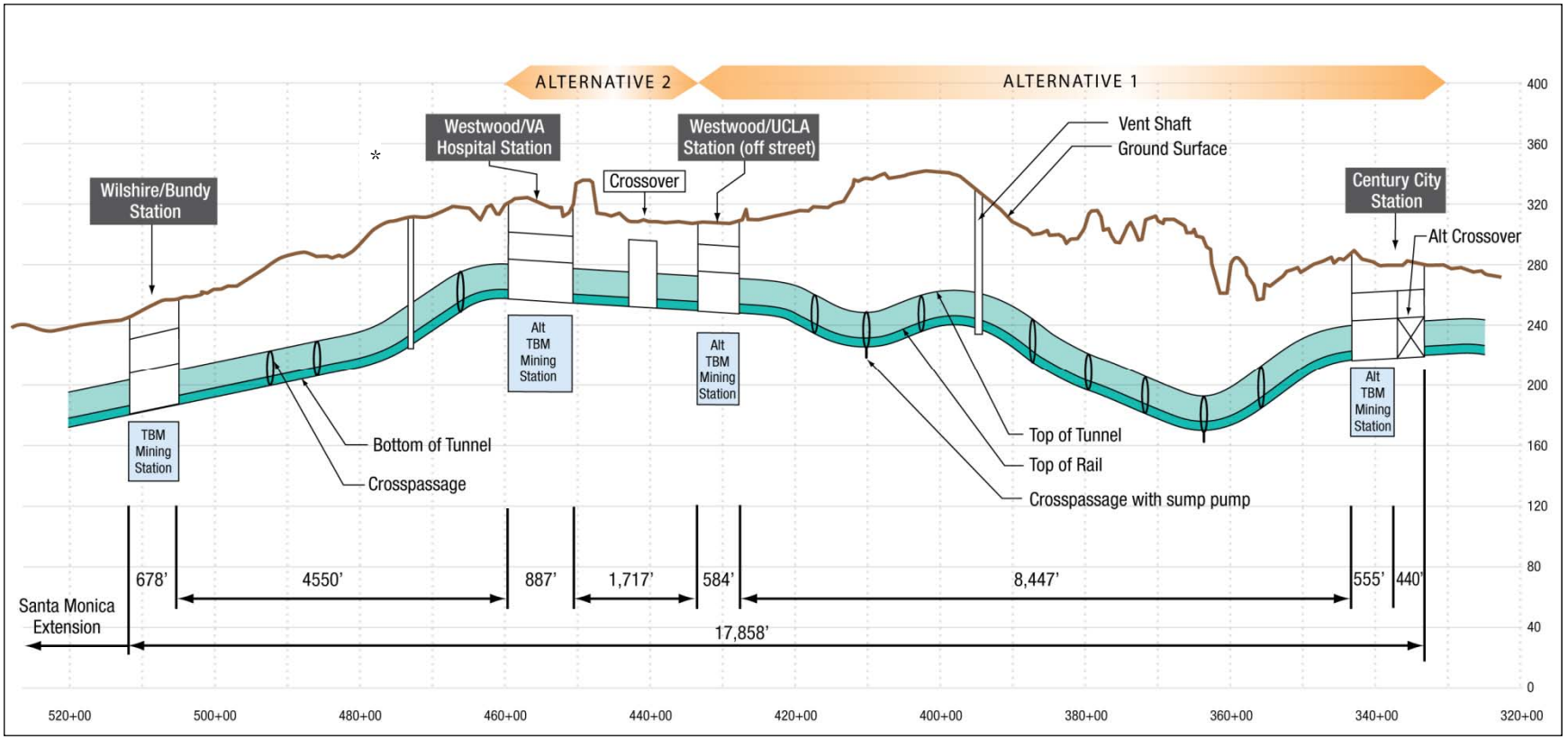


Figure 4-27: Century City Station to Wilshire/Bundy

4.2.5.4 Maintenance Yards

Division 20 Maintenance Yard

This work appears to be essentially surface work in soils that have been exposed over the years to potentially contaminating influences of on-going equipment maintenance and storage. For this reason it is foreseen that excavated materials will be processed for re-use or disposed of at suitable dump sites. Since this yard is actively being utilized coordination of the work and delineation of permissible work areas will be a requirement.

It is assumed that this will involve a structure far less complicated than that for an in-line station and would be a completely separate item of work. As such, it would have virtually no impact on the critical path as long as construction contracts are handled in a timely manner.

Union Pacific Railroad – Los Angeles Transportation Center Rail Yard

This work is essentially at the surface and involves a new, perhaps a singular, alignment from the Division 20 Maintenance yard northward into the north side of the Union Pacific Railroad Los Angeles Transportation Center Rail Yard. The alignment crosses over the Los Angeles River and an existing bridge which means that there will be an approach grade built into the abutment and the bridge crossing structure. This new alignment parallels existing and active track systems and therefore will require strict coordination of the work with train traffic. Preliminary plans depict a couple of bridge piers located in the bottom of the concrete-lined Los Angeles River channel which will require coordination with and permits from the U.S. Army Corps of Engineers and all other resource agencies. More advanced structural design will allow better planning for components such as subsurface construction for the piers and for a more structured consideration of what the abutment construction will consist.

It is assumed that this will involve a structure far less complicated than that for an in-line station and would be a completely separate item of work. As such, it would have virtually no impact on the critical path as long as construction contracts are handled in a timely manner.

4.3 Alternative 2 - Westwood/VA Hospital Extension

Alternative 2 would add the Westwood to VA Hospital Extension to the segments that have been described under Alternative 1. Alternative 2 would also add the Westwood/VA Hospital Station to the stations included under Alternative 1.

The Westwood/VA Hospital station would be located below the Veterans Administration (VA) parking lot in between the I-405 exit ramp and Bonsall Avenue. Several sites in this area have the potential for use in the construction of the station and the tunnels from this site's un-decked station box.

Table 4-12: Estimated Amounts of Excavated Materials for Westwood/VA Hospital Station Construction

Station	Estimated Total CY Excavated	Estimated Daily Haul Truck Trips	Estimated Total Haul Truck Loads
Westwood/VA Hospital	300,000	25-50	15,000

4.3.1 Construction Scenario

The Westwood VA Hospital Station has sufficient surface working area to be able to effectively conduct tunnel mining operations, especially if the location south of Wilshire Boulevard is used.

Station construction would be accomplished without decking and tunneling could proceed east. The Westwood/VA Hospital Station site within Wilshire Boulevard would have more restricted work areas and consideration again would be given to driving tunnels to the west from Century City.

Alternative 2 has a number of terminus options for pocket track/tail track and crossover configurations which will be constructed by cut-and-cover methods.

The segment between the Century City Station and the Westwood/VA Hospital Station is not considered gassy and, hence could be mined with EPB TBMs, a slurry machine not being necessary. Spoil removal will be by conventional methods using spoil cars or conveyors, perhaps in combination, and crane hoisting or vertical conveyance at the station utilized for mining.

Due to the over 2-mile length between the Century City and Westwood/VA Stations, it is expected that 1-2 mid-line vent structures will be required. These vent shafts may be constructed ahead of tunneling, with TBMs transported through the excavation.

Table 4-13: Tunnel and Construction Lengths for Alternatives 1 and 2

Station	Length (feet)	Description
342+80	4940	Exit Century City Station continuing westerly under Santa Monica Boulevard
392+20	0	Water Table drops below tunnel [Take out?]
429+80	3760	Alignment re-enters the Wilshire corridor
431+50	170	Enter Westwood/UCLA Station (Alternative 1)
438+00	650	Exit Westwood/UCLA Station proceeding westerly under Wilshire
457+60	1960	Enter Westwood/VA Station (Alternative 2)
464+00	640	Exit Westwood/VA Station
	15,610 (3.0 miles)	Total Length
	2,270	Station Length
	13,340 (2.5 miles)	Twin Tunnel Length
Scenarios to Consider		
A	Mine with 1 TBM from Westwood/VA Station, remove the TBM from Century City, and return it to Westwood/VA Station.	
B	Mine with 2 TBMs from Westwood/VA and remove them from Century City.	
Station Notes		
Westwood/VA Hospital Station	Westwood/VA Hospital Station would furnish a very workable area for conducting a mining operation and it has the added aspect of remaining an "open" excavation. Therefore, Westwood/VA is the recommended mining station.	
Westwood/UCLA Station	Re-positioned Westwood/UCLA Station has virtually all construction working area needed and is a viable mining station. It is, though, a short distance from the Century City Station, making it a second choice to using Westwood/VA Station for mining operations.	

Alternative 2 would likely be mined with two TBMs driven east from the Westwood/VA Hospital Station towards the Century City Station. Due to the surface work area constraints at the Century City Station, the TBMs may be dismantled underground with the shell left in place. Alternatively, the TBMs could be removed at the Century City Station if the excavation from the Segment 2 construction is left with temporary (removable) decking.

Since the Westwood/VA Hospital station is located on VA property, station excavation could remain open, without the need for temporary decking. No street closures would be necessary; however traffic controls would be needed for entering and exiting of construction traffic onto adjacent roadways.

Utilities, air, water, disposal, electricity, sanitation, and communication would be positioned near the working entries to the tunnels for the mining operations. At least one of the two preferred terminus options for the Westwood/VA Hospital Station has an access site at the Army Reserve area near Federal Way. Mining operations could be set up at this site to further remove tunneling activities from the hospital entrance.

4.3.1.1 Estimated Volume of Excavated Materials from Tunnel Construction

The total volume of excavated materials for the tunnel excavation from Westwood/UCLA to Westwood/VA Hospital is estimated to be approximately 35,000 CY. Based on this volume and the anticipated sequence of construction, the maximum truck counts for tunnel spoil removal is estimated to be from 40-60 daily truck trips.

Removal of spoil materials could later be moved to the crossover area on the Federal Building (GSA) site such that the VA Station could be completed. Spoil haul routes are more efficient from the VA site than the GSA site, especially if, as stated above, the preferred loaded truck haul route is to the south. In general, Wilshire/Veteran to Wilshire/Sepulveda is very congested.

4.3.2 Construction Schedule

Construction of this segment is expected to take approximately 5-½ years. This is based on minimal pre-construction activities. This is based on the tunnel excavation operations from the Westwood/VA Hospital station to excavate east into the Westwood/UCLA Station. Using this scenario, this reach of tunnel and station will be able to proceed independently of any effect of work timing for any of the easterly positioned tunneling contracts.

4.3.3 Options

4.3.3.1 Option 6: VA Hospital – North of Wilshire

Option 6 would locate the Westwood/VA Hospital Station on the north side of Wilshire Boulevard, as opposed to the south side. A potential construction staging site is proposed in the parking lot on the north side of the station box, between the historic chapel and the Wadsworth Theater.

4.4 Alternative 3 – Santa Monica Extension

This alternative includes the seven stations previously described in Alternative 1, plus four additional stations extending west to the City of Santa Monica, for a total of 11 stations assuming Option 1, the Wilshire/Crenshaw Station, is deleted. All optional stations

(discussed above) could also be applied to this alternative. The construction sites for additional stations are described below.

Wilshire/Bundy - Potential construction sites are proposed for the southeast corner of Wilshire Boulevard and Bundy Drive, and the northwest corner of Wilshire Boulevard between Bundy Drive.

Wilshire/26th - Potential construction sites are proposed for the northeast and northwest corners of Wilshire Boulevard and 26th Street.

Wilshire/16th - Potential construction sites are proposed for the northeast and northwest corners of the Wilshire Boulevard and 15th Street intersection.

Wilshire/4th - Potential construction sites are proposed for the southeast corner of Wilshire Boulevard and 4th Street.

Table 4-14: Estimated Amounts of Excavated Materials for Station Construction

Station	Estimated Total CY Excavated	Estimated Daily Haul Truck Trips	Estimated Total Haul Truck Loads
Wilshire/Bundy	160,000	25-50	8,000
Wilshire/26th	140,000	25-50	7,000
Wilshire/16th	140,000	25-50	7,000
Wilshire/4th	480,000	25-50	24,000

4.4.1 Construction Scenario

It is considered impractical to stage tunnel excavation operations from the Wilshire/26th Street site. This is a low-density residential neighborhood and is not close to any freeway. However, if the construction impacts could be mitigated, the tunnel could be excavated from the Wilshire/26th Street Station west towards 4th Street and then east towards the Westwood/VA Hospital Station.

The Westwood/VA Hospital site is considered optimal. The tunnel excavation could proceed from the Westwood/VA Hospital Station area (or alternatively the proposed tunnel site on the U.S. Army Reserve area near Federal Way) to the west, all the way to 4th Street in downtown Santa Monica.

From the Westwood/VA Hospital Station to the Wilshire/4th Street Station, this segment measures approximately 3.7 miles in length. There is little or no potential for gas along this segment, so that mining could be accomplished with EPB TBMs, although a slurry machine may be used due to availability from other segments. If an EPB TBM is used, the spoil removal will be by conventional methods using spoil cars or conveyors, perhaps in combination, and crane hoisting or vertical conveyance at the site utilized for mining.

There is a block-size work area available on the north side of the Wilshire/26th Street Station. Additional work areas are available north and south of the eastern end of the station. Excavation for the Wilshire/26th Street Station would require “lane channelization” in order to install soldier piling and cap beams for support of temporary roadway decking during

short term lane closures that would require the entire roadway to be partially closed. With the approximately 680-ft length of station involved, three partial road closures may be needed in order to assure Wilshire Boulevard would be opened back up to full traffic within allotted time-frames.

The tunnel may be excavated through traces of the Santa Monica fault zone along sections of Wilshire Boulevard. Although the construction methods and tunnel advance rate are not expected to be significantly affected, specific measures may be necessary as discussed in Alternative 1 above.

4.4.1.1 Estimated Volume of Excavated Materials from Tunnel Construction

The total volume of excavated materials for the tunnel excavation from Westwood/VA Hospital to Wilshire/4th is estimated to be approximately 530,000 CY. Based on this volume and the anticipated sequence of construction, the maximum truck counts for tunnel spoil removal is estimated to be from 40-80 daily truck trips.

4.4.2 Construction Schedule

Construction of the Santa Monica Extension is expected to take approximately 5-½ years. This based on minimal pre-construction activities. The tunnel excavation operation will likely use the Westwood/VA Hospital Station to excavate west into Santa Monica. Except for staging two tunnel excavation operations out of this site, this final reach of tunnel and stations will be able to proceed independently of the easterly reaches of the tunnel. This reach includes four (4) new stations, but they may be contracted out separately or as a part of the tunnel portion of the contract. In order to meet the 5½-year construction duration, all stations would be constructed at least partially concurrent.

Table 4-15: Tunnel and Construction Lengths for Alternative 3

Station	Length	Description	
464+00	0	Exit Westwood/VA Station proceeding westerly	This uses Westwood/VA Station for mining westward.
513+30	1,440	Enter Wilshire/Bundy Station	
519+80	650	Exit Wilshire/Bundy Station proceeding westerly under Wilshire	
558+10	3,830	Enter Wilshire/26th St Station	
564+60	650	Exit Wilshire/26th St Station proceeding westerly under Wilshire	
597+70	3,310	Enter Wilshire/16th St Station	
604+10	640	Exit Wilshire/16th St Station proceeding westerly under Wilshire	
641+00	3,690	Enter Wilshire/4th St Station	
658+60	1,760	Exit Wilshire/4th St Station terminating and end of tail track	
	19,460 (3.7 miles)	**Total Length**	
	4,680	**Station Length**	
	14,780 (2.8 miles)	**Twin Tunnel Length**	
Scenarios to Consider:			
A	Mine with 1 TBM from Westwood/VA Station (or alternatively the proposed tunnel site on the U.S. Army Reserve area near Federal Way) through to the Wilshire/4th Street Station and open tail tracks. Or as a less preferable alternative, mine in the opposite direction, from Wilshire/4th Street Station into Westwood/VA Station. Either way, retrieve the TBM and re-use it for the 2nd run of mining.		
B	Mine with 2 TBMs from Westwood/VA Station (or alternatively the proposed tunnel site on the U.S. Army Reserve area near Federal Way) through to the Wilshire/4th Street Station and open tail tracks. Or mine in the opposite direction, from Wilshire/4th Street Station into Westwood/VA Station.		
Station Notes			
Westwood/VA	Westwood/VA Station appears to have sufficient space for mining east and west, as well as good freeway access.		
Wilshire/Bundy	Wilshire/Bundy Station has a reasonable construction work area, but is not situated in a favorable location for mining.		
Wilshire/26th Street	Wilshire/26th Street Station is near the midpoint of the last reach of the system, but the area is severely constrained, with only a small available construction work area that is far from freeway access. This site is not currently considered viable for major tunnel mining.		
Wilshire/16th Street	Wilshire/16th Street Station is too near the terminus Wilshire/4th Street Station and the west terminus to become an effective mining station and doesn't seem to have viable construction work area.		
Wilshire/4th Street	Wilshire/4th Street Station is the west terminus and is viable as a retrieval shaft. It does not have sufficient work area to become a viable tunnel mining station and is located a long distance from freeway access.		

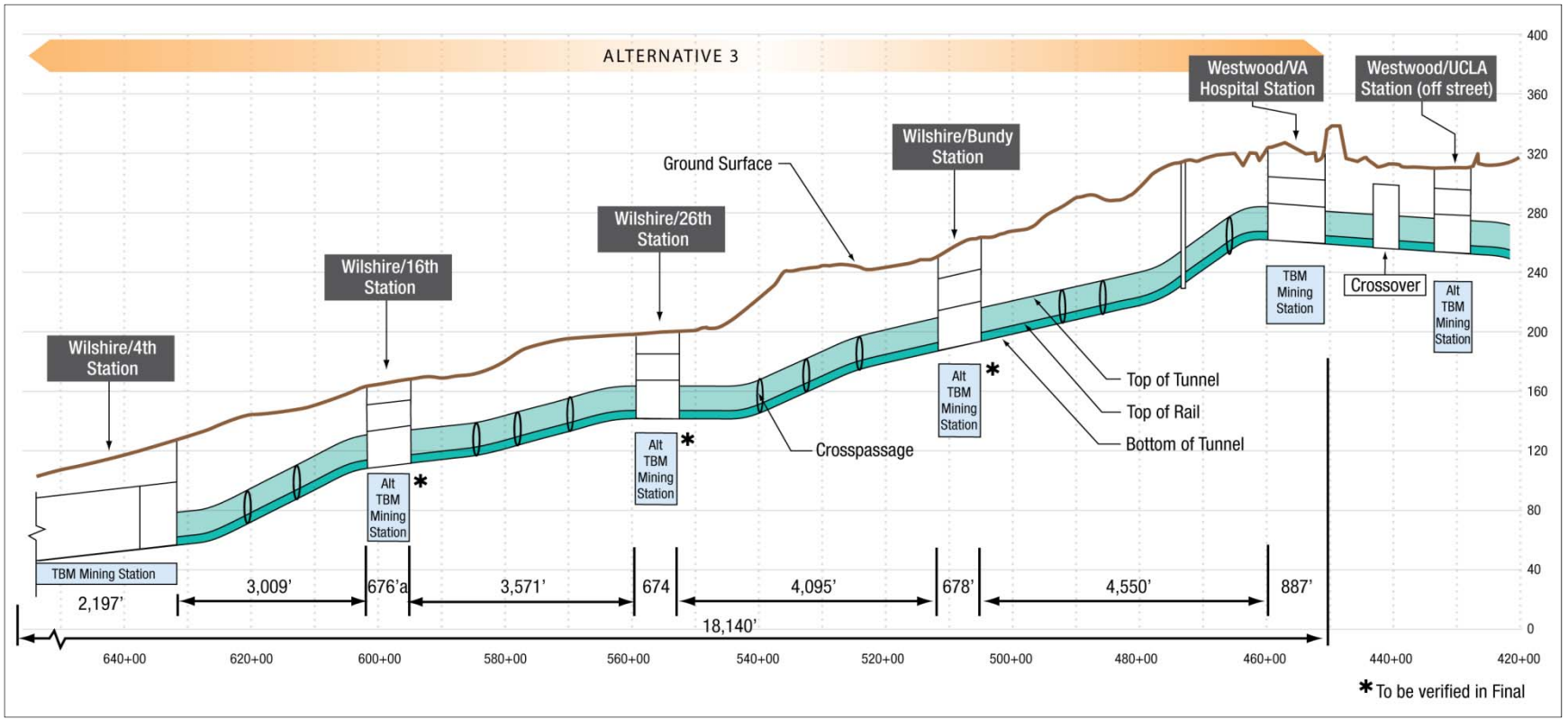


Figure 4-28: Westwood/VA Hospital Station to Wilshire/4th Street

4.5 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

Alternative 4 would add the West Hollywood Extension to the segments described under Alternative 2. Stations along the alternative include:

- Hollywood/Highland, an existing station – Potential construction staging sites are proposed on the property on the east side of Highland Avenue in the block between Selma Place and Hawthorn Avenue, and on the west side of Highland Avenue in the block north of Hawthorn Avenue. This station site has a construction work area of approximately 200 ft by 200 ft, almost one full acre, on the west side near, but not on, Hollywood. Though certainly not large, it is a workable construction site. A McDonald's business facility may be removed for a station entrance. It is thought that the physical aspects of such a removal would not be complicated but that perhaps local perception might present some concern. If so, perhaps McDonalds could be temporarily relocated into another structure through agreement and then be reconstructed on the property left after construction of the subway and station is completed.
- Santa Monica/La Brea - Potential construction staging site is proposed for the northwest corner of Santa Monica Boulevard and La Brea Avenue. The 6 story condominium at the La Brea Station work site might be considered a typical example of multistory structures that will require some special consideration. Any such building will have a substructure support system that will have to be researched and considered in the design for support of excavation for the station, in this case the La Brea Station. There is almost any number of various ways that could have been used originally in the support of the 6 story condominium. The structure could have a basement and have a concrete piling substructure will a concrete spread cap or footing relatively near the surface. The structure might be founded a few stories below and constructed of heavy concrete walls and footings, possibly further supported laterally through a tie-back system. Whatever the construction of the existing structure, it must be researched and provisions made under the contract to alter, possibly increasing side loading restraint for the contractor's approved support of excavation for the La Brea Station.
- Santa Monica/Fairfax - Potential construction staging sites are proposed for the property on the north side and south side of Santa Monica Boulevard between Orange Grove and Fairfax Avenues. This station is favorably located near the midpoint of the reach of tunneling and very likely would become the contractor's choice for excavating tunnels each direction from the excavated station. The general outcome of this station as the origin of tunnel mining is that the tunnels would theoretically be completed in shorter order but the station itself would have a delayed completion.
- Santa Monica/San Vicente - Potential construction areas are limited at this station site. A potential construction staging site is proposed on the south side of Santa Monica Boulevard at the west end of the station on Metro Division 7 property. Unlike the stations along Wilshire Boulevard, the Santa Monica/San Vicente Station and the Beverly Center Area Station and work area are situated in near residential zones rather than being in the midst of active businesses. As such any construction activity will result is some disturbance to individuals and noise limitation along with monitoring will need to be closely controlled. Conceivably sound walls will need to be designed and constructed to substantial heights, maybe thirty feet, or even higher. Wind loading

against such structures can be quite large so the structural support system must be adequate. In addition, the quality of the surface components of the wall itself must be such as to muffle or absorb sound and must also be visually acceptable to the public. Conceivably the wall covering might be easily modified or altered to produce a change in "look" when desirable, and certainly graffiti will need to be periodically removed or otherwise covered. The sound emanating from construction equipment will need to be controlled as much as possible. Back up alarms are designed to alert workers in the vicinity of moving machinery and are generally a requirement of safety regulators but suitable compromises must be worked out to "still" the noise at time when surrounding neighbors are sleeping. Public relations efforts with the immediate neighbors will be an on-going challenge.

- Beverly Center Area - A potential construction site is proposed on the south side of 3rd Street, between San Vicente and La Cienega Boulevards. A station at this site would have a very limited area for construction staging. This will curtail materials stock piling and storage of equipment and supplies. This severe lack of construction work area will mean that the contractor will need to acquire his own storage and handling work site and plan the production work accordingly. The cost for building this station will reflect the constraints imposed by lack of construction work area.

  The Beverly Center Area Station has active storm drain pipes that run parallel to the length of the station. One pipe is a 27" diameter vitrified clay pipe and the other is a 33" diameter reinforced concrete pipe. Possibly these pipes could be supported under the roadway decking but it is suggested that they be replaced with a new continuous/ extruded pipe hung under the roadway decking. The existing pipes would be plumbed into and out of manholes at each end of the station. Alternatively, the existing pipe lines could be re-routed around instead of through the station area, if substantial room is located. It is noted that other site locations encounter storm drain piping to varying degrees but that in itself should not be considered any more detrimental than the necessary re-routing of utility services.

Table 4-16: Estimated Amounts of Excavated Materials for Station Construction for the West Hollywood Extension

Station	Estimated Total CY Excavated	Estimated Daily Haul Truck Trips	Estimated Total Haul Truck Loads
Connection Structure	130,000	25-50	8,200
Beverly Center Area	145,000	25-50	7,200
Santa Monica/San Vicente	200,000	25-50	10,000
Santa Monica/Fairfax	140,000	25-50	7,000
Santa Monica/La Brea	140,000	25-50	7,000
Hollywood/Highland *	330,000	40-80	16,600

* Access shaft adjacent to existing Hollywood/Highland station.

4.5.1 Construction Scenario

This alternative would have the same general construction techniques as described under Alternative 2 for the alignment between Wilshire/Western and Westwood/VA Hospital Extension.

With regard to the West Hollywood Extension, there are some locations along the alignment where shallow groundwater is encountered. Previous excavation sites have necessitated the use of dewatering to lower the groundwater level. As discussed previously, the use of soldier piles with lagging may be inadequate in these areas and a slurry (diaphragm) wall, secant pile or similar system may be necessary. In addition, some potentially gassy ground may be encountered in the southern portion of the alignment. However, it is anticipated that either an EPB or Slurry-Face TBM could be used. Spoil removal and other construction methods would be similar to that described in the preceding sections.

Mining operations could proceed with one or two TBMs from the Santa Monica/La Brea Station, the Santa Monica/San Vicente Station, the Beverly Center Area Station, or the Santa Monica/Fairfax Station eastward toward the existing station at Hollywood/Highland, where the TBM(s) would be retrieved and re-used for mining. The reaches from the selected mining station would be mined a longer distance from Santa Monica/Fairfax south to Wilshire/La Cienega and, depending upon the time constraints, could be mined with either one or two TBMs. The Santa Monica/Fairfax Station site is the most central location from which to mine.

Although there are substantial concerns regarding community impacts, the Santa Monica/ Fairfax Station could potentially be used as a tunnel mining site. Mining operations would proceed from this station east towards the existing station at Hollywood/Highland and south towards the Wilshire/La Cienega Station. The construction work site for the mining operations would likely be adjacent to North Fairfax Avenue. Construction traffic would need to be separated by traffic control measures. It is expected that a side entry of approximately 40-ft in length would afford access for the TBM and construction machinery to the tunnel headings at both ends of the station.

Excavation of the Santa Monica/Fairfax Station would require “lane channelization” in order to install soldier piling and cap beams for support of temporary roadway decking during short-term lane closures that would require the entire roadway to be closed. With the approximately 680-ft length of station involved, three road closures may be needed in order to ensure that Santa Monica Boulevard would be opened back up to full traffic within allotted time-frames.

Similar to Segment 2, the easterly drive is shorter than the westerly drive and could potentially be accomplished with one TBM to be extracted at the Hollywood/Highland Station and re-launched at Santa Monica/Fairfax. The longer westerly portion would be constructed with two TBMs. These TBMs could be either dismantled or removed intact at the Wilshire/La Cienega station, depending on whether a retrieval shaft would have been provided there as part of Segment 2 construction. Utilities, air, water, disposal, electricity, sanitation, and communication would be positioned near the working entries to the tunnels for the mining operations.

4.5.1.1 Preconstruction

This work will be essentially as described above and there are no recognized differences.

4.5.1.2 Tunnel Construction

This work will be essentially as described above and there are no recognized differences.

Estimated Volume of Excavated Materials from Tunnel Construction

The total volume of excavated materials for the tunnel excavation from Wilshire/La Cienega to Hollywood/Highland is estimated to be approximately 760,000 CY. Based on this volume and the anticipated sequence of construction, the maximum truck counts for tunnel spoil removal is estimated to be from 40-80 daily truck trips.

4.5.1.3 Underground Utilities

This work will be essentially as described above and there are no recognized differences.

4.5.1.4 Stations

There are four new underground stations to construct and two existing stations to tie in to, or enter with the TBM. This station construction work will be essentially as described above and there are few recognized differences.

4.5.1.5 Street/Site Restorations

This work will be essentially as described above and there are no recognized differences.

4.5.1.6 Vent Shafts and Emergency Exits

This work will be essentially as described above and there are no recognized differences.

Table 4-17: Tunnel and Construction Lengths for the West Hollywood Extension

Station	Length (feet)	Description
0+00	0	Take off from Highland/Hollywood Station at the Red Line and proceed southerly.
9+70	970	Exit Highland/Hollywood Station
50+70	4,100	Enter Santa Monica/La Brea Station
56+40	570	Exit Santa Monica/La Brea Station
69+00	1,260	Enter Santa Monica/Fairfax Station
74+50	550	Exit Santa Monica/Fairfax Station
156+70	8,220	Enter Santa Monica/La Cienega Station
166+00	930	Exit Santa Monica/La Cienega Station
215+50	4,950	Enter Beverly Center Area Station
221+20	570	Exit Beverly Center Area Station
263+13.23	4,193	Enter Wilshire/La Cienega Station
	26,313 (5.0 miles)	Total Length
	3,590	Station Length
	22,723(4.3 miles)	Twin Tunnel Length
Scenarios to Consider		
A	Mine east and then north from Santa Monica/La Brea and remove from Hollywood/Highland. Mine from Santa Monica/La Brea west and then south to Wilshire/La Cienega and remove them from a retrieval shaft at Wilshire/La Cienega.	
B	Mine east and then north from Santa Monica/San Vicente and remove from Hollywood/Highland. Mine from Santa Monica/San Vicente west and then south to Wilshire/La Cienega and remove them from a retrieval shaft at Wilshire/La Cienega.	
C	Although severely constrained and not considered optimal, the tunnels could be mined east and then north from Santa Monica/Fairfax and removed from Hollywood/Highland. Also mine from Santa Monica/Fairfax west and then south to Wilshire/La Cienega and remove them from a retrieval shaft at Wilshire/La Cienega.	
Station Notes		
Wilshire/ La Cienega	Wilshire/La Cienega has a fairly good work site, but by the time Alternative 4 or 5 is under construction, this would be a working station. Plus the connection into the Segment 2 tunnel is tangential. Therefore, this likely not a good site for mining operations. Note that a retrieval shaft near the tangential tie-in may be economical and would help to facilitate the complicated work of constructing the tie-in.	
Beverly Center Area	Beverly Center Area Station site has only a relatively small potential construction work site and is close to Wilshire/La Cienega Station.	
Santa Monica/San Vicente	Santa Monica/San Vicente Station site, located on Santa Monica Boulevard between San Vicente and La Cienega Boulevards (at Westbourne Drive), has limited construction work areas, which would constrain tunnel mining operations.	
Santa Monica/ Fairfax	Santa Monica/Fairfax Station is severely constrained and is not considered optimal for mining operations.	
Santa Monica/La Brea	Santa Monica/La Brea Station has some parking lots that could become fairly good work areas for tunnel mining operations. Although it is located close to the northerly (Highland Station) terminus, which is less efficient than other sites, it may be the most viable tunnel mining location.	
Hollywood/ Highland	Hollywood/Highland Station exists, but it may need to be "opened up" to make it a transfer station. There seems some room for construction work area on Highland south of Hollywood. A TBM retrieval shaft might be economical.	

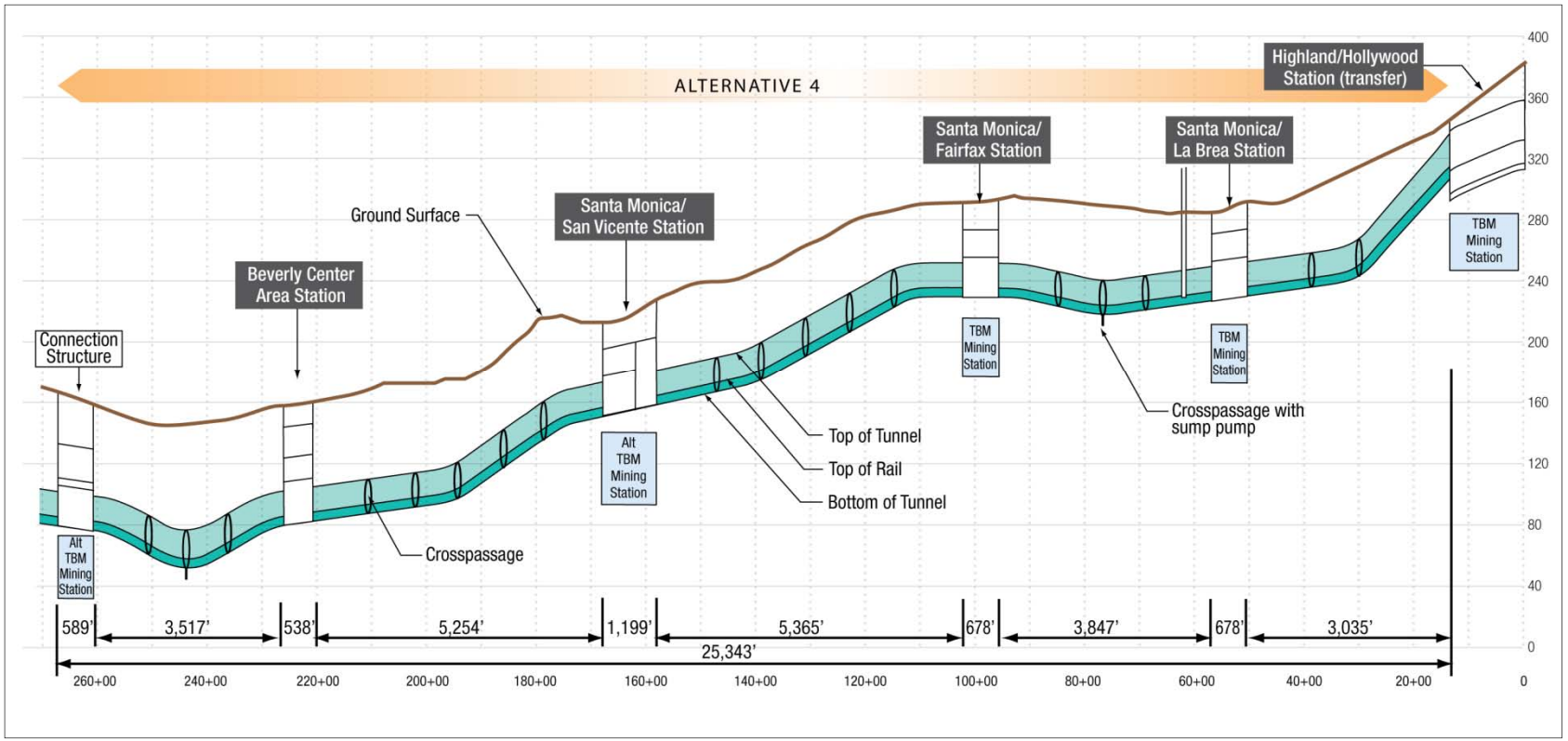


Figure 4-29. West Hollywood Extension, Hollywood/Highland to Connecting Structure

4.5.1.7 Summary

Table 4-18: Sequence of Construction Activities – West Hollywood Extension

Activity	Duration	Description	Equipment Required
Pre-construction	None is expected	Controlled excavation	Largely hand tools and small equipment
Tunnel Construction	Approximately 3 or more years, counting TBM purchase	Excavation and CIP tunnel lining	Pressurized-Face TBM, potentially slurry pumping and separation equipment, concrete equipment
Underground Utilities	Approximately 6 months	Locate, move and support utilities	Hand tools and small excavation equipment
Station Excavation	Approximately 1 year	Support of excavation and cut-and-cover excavation	Various excavation equipment and a crane
Station Construction	Approximately 2-½ years	Form and place concrete structure, finish work, architectural and mechanical	Concrete form and placing equipment
Street/Site Restorations	Approximately 4 months	Paving and sidewalks	Paving equipment
Vent Shafts and Emergency Exits	Concurrent, Approximately 6 months	Shafts and cross-passages	Crane and tunnel equipment

4.5.2 Construction Schedule

Construction of the West Hollywood Extension is expected to take approximately 6-½ years (assuming no need for pre-construction). It is most likely that the tunnel excavation operation will use the Santa Monica/La Brea Station, in which to excavate the tunnels. Using this scenario, the excavation of the tunnels would take place in opposite directions out of the same station. This work would be able to proceed independently of all other tunneling work except for where the tunnel would tie into the Wilshire/La Cienega Station. If additional construction work area can be provided, the Santa Monica/San Vicente Station site would be a viable alternative for tunnel mining.

This reach includes four (4) new stations, but they might be contracted out separately or as a part of the tunnel portion of the contract. In order to meet the 6-½ year construction duration, all stations would be constructed at least partially concurrently.

The tunnel tie-in into the station at La Cienega will consist of constrained or "slow" work, based on the construction abutting completed work. For this reason, an extra year has been added to the schedule. If the station utilized for tunnel excavation is near the mid-point in the reach, the potential savings in time for excavation could be great enough to reduce this need for an additional year.

4.6 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

Alternative 5 would add the West Hollywood Extension to the work described under Alternative 3. Stations and tunnels along the alternative include have already been addressed above and include all previously noted segments.

4.6.1 Construction Scenario

Alternative 5 adds the West Hollywood Extension to the work described under Alternative 3. This scenario involves the entire sum total of all work mentioned above. It is the complete system.

The construction methods and expected scenarios are not significantly different in Alternative 5 then as described in the preceding sections.

4.6.2 Construction Schedule

Alternative 5 would entail construction of all segments (Wilshire/Western to Westwood/ UCLA Extension, Westwood/VA Hospital Extension, Santa Monica Extension, and the West Hollywood Extension). The duration of construction for all segments is could theoretically be expected to take approximately 7-½ years if all work is concurrently scheduled and executed.

However, it would be difficult for all of these segments to be advanced concurrently given the scale of construction activities. The existing roadways and infrastructure would present constraints to advancing the many different construction operations at the same time. In addition, there would be accumulated impacts on the community. It is more probable to expect that one or more of the Segment 1, 2, and 3 reaches would be substantially completed before a next reach can begin. If only a minimum of overlap between the segments is assumed, with appropriate geographical separation, it can be expected that the total construction period could be extended to as much as 20 years.

Nevertheless, the overlap between segments can be increased through effective program management and the provision of sufficient resources, funding and community support. In overall scenarios in which the work is realistically optimized through an aggressive design and construction program, the total construction period could be reduced to approximately 10 to 16 years.

Accounting for multiple-shift work operations, it is expected that the total number of construction workers will be between 500 and 750 at such peak construction periods.

4.7 Maintenance and Operation Facility Sites

Development of maintenance facilities will include the construction of storage tracks, shop buildings, and associated wayside structures, such as vehicle cleaning facilities, electrical substations and employee facilities. Generally, the structures would be low-rise, from two to three stories in height (maximum), with parking provided at areas physically separated from the trackways.

Construction of these facilities would entail some demolition, site clearing and grading. Shallow excavations and/or pile installations would be required for structure foundations. Trenching and excavation would also be required for utilities and rail systems installations.

4.8 MOS 1 – Fairfax Extension

4.8.1 Construction Scenario

Construction of MOS 1 is the same as Segment 1 of Alternative 1 and is assumed to be the first item of work to be done. Should this be the only work performed, the station at Wilshire/Fairfax would become the terminus and would likely include a crossover and/or tail tracks.

4.8.2 Construction Schedule

Design and construction of MOS 1 (from Wilshire/Western to Wilshire/Fairfax) is expected to take approximately 7-½ years (see previous Segment 1 discussion).

It is expected that several tunneling contracts will be let at the same time so that some construction can occur simultaneously on different reaches of tunnel. The time to permit the construction, assembly or retrofitting of TBMs, and the completion of necessary excavation at the stations, is approximately 9 to 12 months. Total time to construct the tunnels and stations is approximately 7-½ years, counting pre-construction activities for handling "tar pits" and historical fossilization.

4.9 MOS 2 – Century City Extension

4.9.1 Construction Scenario

This work has been described above and there are no notable differences.

Construction of MOS 2 would not be constructed in isolation as several key elements depend on the completion of MOS 1.

4.9.2 Construction Schedule

Generally, the schedule for MOS 2 is dependent on completion of MOS 1. Similar to Segment 2 of Alternative 1, design and construction of MOS 2 (from Wilshire/Fairfax to Century City) would be largely dependent on the options chosen. Similar to MOS 1, the total time to construct the MOS 2 tunnels and stations is approximately 6-½ years.

Depending on the work breakdown, each tunneling contract will take approximately 24 to 36 months to complete both excavation and concreting, using two TBMs per contract. Construction of the concrete structure of each cut-and-cover station will take about 27 to 42 months to complete. The construction process would be similar to that used for MOS 1 construction, except that it is not expected to encounter concentrations of hydrocarbons and gasses.

4.10 Parking Facilities at Stations

No parking facilities are currently envisioned for the project. If considered, parking facilities would be severely limited, mainly due to space constraints at the station locations. Depending on future studies, minimal parking facilities could be developed for Metro operations and maintenance personnel.

At some station sites, replacement parking facilities may be developed in conjunction with the station construction, however such parking areas would only replace parking removed by the construction operations.

For surface facilities, construction would involve site grading, subgrade preparation, paving, striping, and signage. Equipment used would include compressors, pumping equipment, paving machines, dump trucks, front-end loaders, compacting equipment and water trucks.

If parking garages were selected for replacement parking in later stages of design, equipment typically used in building construction would be involved. Excavation and/or piling for foundations would be followed by site grading and concrete placement operations. Equipment required would include cranes, delivery trucks, spoil haulers, concrete trucks and concrete pumping equipment, generators/compressors, dump trucks, front-end loaders, compacting equipment and water trucks.

4.11 Systems Installations and Facilities

4.11.1 Trackwork

Trackwork will be constructed below grade in the completed tunnels and station structures. Trackwork construction involved the installation of trackbed components on the completed concrete structures, followed by the laying of rails. In general, third rail (traction power) and conduits for systems installations will be constructed at the same time as, or closely following, the trackwork. Rails, conduits, and associated components will be brought into the tunnels at selected station locations with appropriate off-street access, and in some cases via the existing system.

4.11.2 Electrical Substations and Facilities

In general, electrical substation and facilities will be located within available spaces in the stations, crossovers, ventilation shafts, emergency exits, and related facilities. Some electric power equipment may be located within street-level spaces. Substations will include Traction Power Substations (TPSS) and smaller facility power substations. The locations of these facilities will be spaced along the alignment and may be located at or near to each station. These electrical facilities will be appropriately separated from the public (revenue) areas of the system and will include appropriate security.

4.11.3 Communications and Signaling

Communications and signaling systems need less space than electrical facilities and can be accommodated within rooms and niches in the stations, tunnels, crossovers, ventilation shafts, emergency exits, cross-passages, and related facilities. The locations of these facilities will be spaced along the alignment and will be positioned at or near to each station. These facilities will be appropriately separated from the public (revenue) areas of the system and will include appropriate security.

Operations and control facilities will be housed within existing Metro facilities or may be incorporated into above-ground ancillary facilities at stations and/or maintenance yards for this project.

5.0 AFFECTED ENVIRONMENT

This section summarizes the affected environment for particular environmental disciplines affected by construction. The conditions described in this section would only occur during construction and would be temporary and short-term, as opposed to ongoing during the operational phase of the proposed alternatives. This section is drawn from the technical reports in these various disciplines.

5.1 Traffic, Parking, and Transit

Construction activities are likely to impede the normal flow of traffic causing some lanes and roadway segments in the study area to be closed. In order to minimize any disruption to traffic, mitigation of potential traffic impacts, traffic management and control measures will be implemented with the coordination and involvement of appropriate public agencies.

Street closures required for construction would generally be limited to nighttime, weekend, and/or off peak closures. No closures are expected during morning and evening peak travel periods, except for specific areas discussed in the following sections. Potential street closure locations would be identified in close coordination with the local agencies. As these street closure requirements are identified, traffic would be rerouted to adjacent intersections with detours clearly signed and marked.

The estimated construction-related impacts on traffic are based on construction staging for the five build alternatives as well as two Minimum Operating Segments (MOSs). More detailed information on construction staging is presented in the Traffic Handling and Construction Staging Technical Report (Metro, 2010).

Although sixteen alignment and six station-location options are still under consideration along the proposed alignment (particularly in the Century City-Westwood area), the construction staging assumes that the two MOSs and five alternatives would follow the "Baseline" alignments as shown on the key map drawings C1-100, C2-100, C3-100, C4-100 and C5-100 in Traffic Handling and Construction Staging Technical Report (Metro, 2010). Currently, the alignment is subdivided into the following segments:

- Alternative 1: Westwood/UCLA Extension
- Alternative 2: Westwood/VA Hospital Extension
- Alternative 3: Santa Monica Extension
- Alternative 4: Westwood/VA Hospital plus West Hollywood Extension
- Alternative 5: Santa Monica Extension plus West Hollywood Extension
- MOS-1: Wilshire/Western (existing station) to Wilshire/Fairfax Station
- MOS-2: Wilshire/Fairfax Station to Century City Station

5.1.1 Regional Roadway Network

The study area is generally well served by a roadway network of arterial streets and freeways, which provide options for travel both north/south and east/west. However, the study area contains some of the most congested arterial streets in the County. Existing development

throughout the study area prevents the addition of new roadways and severely limits the expansion of existing facilities.

5.1.1.1 Freeways

Two freeways traverse the study area. The San Diego Freeway (I-405) runs north/south through the study area just west of Westwood and UCLA and provides the primary access to/from the north and south. The Santa Monica Freeway (I-10) runs just outside the study area until Santa Monica city limits but parallels key east-west arterials and provides regional access from the east. Both freeways are widely recognized as some of the most congested in both the Los Angeles region and the nation, and experience high traffic volumes throughout the day, well beyond the traditional peak travel hours. The study area freeway network is described below.

- I-10 Freeway (Santa Monica Freeway) – The Santa Monica Freeway is a major east/west freeway that traverses the southern portion of the study area. It extends from the Pacific Ocean and the City of Santa Monica on the west to downtown Los Angeles and beyond on the east. Near the proposed project alignment, the Santa Monica Freeway provides five lanes of travel in each direction, including auxiliary lanes. The ramps that lie in the study area include the Cloverfield Boulevard, 20th Street, and Lincoln Boulevard on- and off-ramps. Peak hour conditions along the Santa Monica Freeway are generally congested in both directions, with a slightly higher volume of traffic traveling west in the a.m. peak and east in the p.m. peak. For this reason, observations of eastbound and westbound on-ramps indicate greater congestion in the peak direction.
- I-405 Freeway (San Diego Freeway) – The San Diego Freeway is a major north/south freeway that connects the San Fernando Valley to West Los Angeles, the South Bay area, and Orange County. In the study area, the San Diego Freeway provides five to six lanes of travel in each direction, including northbound and southbound carpool lanes and auxiliary lanes. The ramps that lie in the study area include the Sunset Boulevard, Wilshire Boulevard, Santa Monica Boulevard, and Olympic Boulevard on- and off-ramps.

5.1.1.2 Daily Traffic Volumes

This section describes freeway volumes at key interchanges and segments in the study area.

- I-10 Freeway (Santa Monica Freeway) – In the study area, the average daily (weekday) traffic[26] on the Santa Monica Freeway varies between 148,000 vehicles at the Lincoln Boulevard interchange, 192,000 vehicles at the Cloverfield Boulevard interchange, and 244,000 vehicles at the Bundy Drive interchange. At key interchanges south of the study area, average daily traffic varies between 260,000 vehicles at the Overland Avenue Interchange, 267,000 vehicles at the Robertson Boulevard Interchange, and 277,000 vehicles at the La Brea Avenue Interchange
- I-405 Freeway (San Diego Freeway) – In the study area, the average daily (weekday) traffic on the San Diego Freeway varies between 319,000 vehicles at the Olympic Boulevard interchange, 302,000 vehicles at the Santa Monica Boulevard interchange, 289,000 vehicles at the Wilshire Boulevard interchange, and 281,000 vehicles at the Waterford Street/Montana Avenue interchange.

[26] *2008 Traffic Volumes on California State Highways*, State of California Department of Transportation, Traffic Operations Division.

Arterials

The study area contains some of the most congested streets in Los Angeles County. The high population and employment densities in the study area have resulted in eastbound and westbound directional travel being congested during both the a.m. and p.m. peak periods. The arterials in the study area serve the employment centers as well as local and regional travel. In addition, they are used as alternates to the I-10 and I-405 freeways during non-recurrent delays such as accidents, breakdowns, lane closures and other random events. Key east/west arterials include Hollywood, Sunset, Santa Monica, Beverly, Wilshire, Olympic, and Pico Boulevards and Melrose Avenue. Key north/south arterials include vital streets such as Crenshaw, La Cienega, San Vicente, Robertson, Beverly Glen, Westwood, Sepulveda, and Lincoln Boulevards; Western, La Brea, and Fairfax Avenues; and Bundy Drive. These key arterials can be classified as one of two street types: a Major Class II Highway or a Secondary Highway. A Major Class II Highway is defined as a roadway with a 104' right-of-way (ROW), 12' sidewalks, 13' curb lanes (off-peak parking, peak through), four full-time through lanes, and one dedicated left turn lane/median. A Secondary Highway is defined as roadway with a 90' ROW, 10' sidewalks, 19' curb lanes (all day parking), four full-time through lanes, and one dedicated left turn lane/median. The key study area arterials are described below.

Major East/West Arterials (Listed from North to South)

- Hollywood Boulevard – Hollywood Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Laurel Canyon Boulevard on the west to Sunset Boulevard on the east. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- Sunset Boulevard – Sunset Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from the Pacific Coast Highway on the west to Grand Avenue in Downtown Los Angeles to the east. In the study area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in some locations. Dedicated left-turn lanes are provided at most intersections.
- Santa Monica Boulevard – Santa Monica Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Ocean Avenue in Santa Monica on the west to Sunset Boulevard in the Silver Lake neighborhood of Los Angeles on the east. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- Melrose Avenue – Melrose Avenue is a major east/west arterial that is classified as a Secondary Highway.
- Beverly Boulevard – Beverly Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Santa Monica Boulevard in Beverly Hills on the west to Glendale Boulevard near Downtown Los Angeles on the east. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- Wilshire Boulevard – Wilshire Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Ocean Avenue in Santa Monica on the west to Grand Avenue in Downtown Los Angeles on the east. In the study area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane

during peak periods in many locations. Dedicated left-turn lanes are provided at most intersections.

- Olympic Boulevard – Olympic Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from 5th Street in Santa Monica on the west to Downtown Los Angeles and further on the east. In the study area, it generally has two to three full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in some locations. Dedicated left-turn lanes are provided at most intersections.
- Pico Boulevard – Pico Boulevard is a major east/west arterial that is classified as a Major Class II Highway. It extends from Ocean Avenue in Santa Monica on the west to Central Avenue in Downtown Los Angeles on the east. In the study area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in many locations. Dedicated left-turn lanes are provided at most intersections.

Major North/South Arterials (Listed from East to West)

- Western Avenue – Western Avenue is a major north/south arterial that is classified as a Major Class II Highway. It extends from Los Feliz Boulevard on the north to San Pedro on the south. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at major intersections.
- Crenshaw Boulevard – Crenshaw Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from Wilshire Boulevard on the north to the City of Rancho Palos Verdes on the south. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.
- La Brea Avenue – La Brea Avenue is a major north/south arterial that is classified as a Major Class II Highway. It extends from Hollywood Boulevard on the north to Century Boulevard on the south. In the study area, it generally has two full-time travel lanes in each direction, with the parking lane used as a travel lane during peak periods in many locations. Dedicated left-turn lanes are provided at most intersections.
- Fairfax Avenue – Fairfax Avenue is a major north/south arterial that is classified as a Major Class II Highway north of Melrose Avenue, and Secondary Highway south of Melrose Avenue. It extends from Hollywood Boulevard on the north to La Cienega Boulevard on the south. In the study area, it has one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- La Cienega Boulevard – La Cienega Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from Sunset Boulevard on the north to El Segundo Boulevard on the south. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- San Vicente Boulevard – San Vicente Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from Santa Monica Boulevard on the north to Venice Boulevard on the south. In the study area, it generally provides two to three travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.

- Robertson Boulevard – Robertson Boulevard is a major north/south arterial that is classified as a Secondary Highway. It extends from Santa Monica Boulevard on the north to Washington Boulevard on the south. In the study area, it generally provides one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- Beverly Glen Boulevard – Beverly Glen Boulevard is a major north/south arterial classified as a Secondary Highway north of Wilshire Boulevard and Major Class II Highway south of Wilshire Boulevard. It extends from Ventura Boulevard on the north to Pico Boulevard on the south. In the study area, it generally provides one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- Westwood Boulevard – Westwood Boulevard is a major north/south arterial that is classified as a Major Class II Highway north of Santa Monica Boulevard, and Secondary Highway south of Santa Monica Boulevard. It extends from Le Conte Avenue and the UCLA campus on the north to just south of National Boulevard. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- Sepulveda Boulevard – Sepulveda Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from the San Fernando Valley on the north to the City of Manhattan Beach on the south. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.
- Bundy Drive – Bundy Drive is a north/south arterial. In the City of Los Angeles, it is classified as a Collector north of Wilshire Boulevard and Secondary Highway south of Wilshire Boulevard. It extends from the hills above Sunset Boulevard on the north to Centinela Avenue on the south. In the study area, it generally has one to two travel lanes in each direction. Dedicated left-turn lanes are provided at most major intersections.
- Lincoln Boulevard – Lincoln Boulevard is a major north/south arterial that is classified as a Major Class II Highway. It extends from San Vicente Boulevard in Santa Monica on the north to Sepulveda Boulevard on the south. In the study area, it generally has two travel lanes in each direction. Dedicated left-turn lanes are provided at most intersections.

5.1.1.3 Pedestrian Volumes

High pedestrian activity (established as peak hour volumes of 500 or more pedestrians crossing a study intersection) was observed around these potential station locations:

- Wilshire/Fairfax
- Wilshire/Beverly
- Century City
- Wilshire/4th
- Santa Monica/La Brea
- Santa Monica/Fairfax
- Santa Monica/San Vicente
- Beverly Center

Overall, the highest levels pedestrian activity was recorded in the Westwood station area, followed by Beverly Hills and downtown Santa Monica. Pedestrian activity was also significant along the Santa Monica corridor in West Hollywood.

5.1.2 Level of Service

The commonly accepted operational analysis methodology from 2000 Highway Capacity Manual (HCM) (Transportation Research Board, 2000)was used to estimate delay and corresponding LOS at each study intersection. The operations analysis methodology rates intersection conditions based on the average delay, measured in seconds, experienced by drivers.

LOS is a qualitative measure used to describe the condition of traffic flow, ranging from LOS A (free flow conditions) to LOS F (congested conditions), with LOS E representing theoretical capacity. Table 5-1 provides LOS definitions for signalized intersections using the HCM methodology. Weekday a.m. and p.m. peak hours were selected for analysis because they represent the most critical periods of traffic congestion in the study area, compared to other time periods such as weekday or weekend midday. The LOS definitions and ranges of delay shown in the following table represent average conditions for all vehicles at an intersection across an entire hour. Delays longer than the average condition are experienced by motorists on certain movements and/or during peak times within the peak hour.

Generally, the minimum acceptable LOS for any intersection in an urbanized area is LOS D. Because the study area is in an urbanized area, LOS D will serve as the minimum acceptable standard for the Westside Sunway Extension.

5.1.3 Alternative 1 –Westwood/UCLA Extension

Construction impacts on transportation would involve traffic, transit, and pedestrian movements primarily along Wilshire Boulevard, from Western Avenue (current terminus of the Metro Purple Line) to the general vicinity of Westwood Boulevard. In addition to being one of the major travel corridors in the study area, Wilshire Boulevard is a major transit link that includes Metro Rapid bus service and a future dedicated bus lane.

High levels of boarding activities take place along the affected portions of Wilshire Boulevard, including station locations such as Fairfax Avenue, Century City, and Westwood Boulevard. In Westwood, affected transit operations include buses operated by Metro, Santa Monica Transit Big Blue Bus, Culver City Bus, and the UCLA Campus Shuttle. Pedestrian and bicycle movements could be affected at bus stops, street crossings, and along portions of streets affected by construction.

5.1.4 Alternative 2 – Westwood/VA Hospital Extension

Construction impacts on transportation would include those identified in Section 5.1.1 plus those occurring west of the Westwood/UCLA station area. Added items include general traffic, transit, and pedestrian movements between the general vicinity of Westwood Boulevard and the VA Hospital just west of I-405. In addition to Wilshire Boulevard traffic, construction impacts could involve I-405 ramps. Added transit impacts would involve Metro bus operations on Wilshire Boulevard near the Veterans Hospital. Pedestrian and bicycle movements could be affected at bus stops, street crossings, and along portions of streets affected by construction.

Table 5-1: Level of Service Definitions for Signalized Intersections

Level of Service	Control Delay (seconds/vehicle)	Interpretation*
A	<10.0	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low density.
B	>10.0 and <20.0	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.
C	>20.0 and <35.0	These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	>35.0 and <55.0	At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicle stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	>55.0 and <80.0	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.
F	>80.0	This level, considered unacceptable by most drivers, often occurs with oversaturation; that is, when arrivals flow rates exceed the capacity of the intersection. It may also occur at high volume-to-capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Source: Highway Capacity Manual, Transportation Research Board, 2000.

*Level of service interpretation was derived from Highway Capacity Manual 1994, Transportation Research Board, 1994.

5.1.5 Alternative 3 – Santa Monica Extension

Construction impacts on transportation would include those identified in Section 5.1.2 plus those occurring west of the VA Hospital station area. Added items include general traffic, transit, and pedestrian movements between the vicinity of the VA Hospital and Santa Monica (Wilshire Boulevard and Fourth Street). Added transit impacts would involve Metro and Santa Monica Transit Big Blue Bus service on Wilshire Boulevard. Pedestrian and bicycle movements could be affected at bus stops, street crossings, and along portions of streets affected by construction.

5.1.6 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

Construction impacts on transportation would include those identified in Section 5.1.2 plus impacts on transportation between the existing Hollywood/Highland Station and the general vicinity of Wilshire Boulevard and La Cienega Boulevard. Both Wilshire Boulevard and Santa Monica Boulevard would be affected by construction-related impacts. In West

Hollywood, construction impacts would also affect Metro and West Hollywood City Line/Dayline bus operations. Pedestrian and bicycle movements could be affected at bus stops, street crossings, and along portions of streets affected by construction.

5.1.7 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

Alternative 5 incorporates extensions to Santa Monica as well as West Hollywood. Traffic-related impacts would include involve Wilshire Boulevard and Santa Monica Boulevard. Large segments of Wilshire Boulevard would be affected by construction in several station areas between Western Avenue and Fourth Street in Santa Monica. Traffic on Santa Monica Boulevard would be affected between La Brea Avenue and La Cienega Boulevard and potentially in Century City, depending on the final decision for a station location.

Bus routes operated by Metro, the Santa Monica Big Blue Bus, Culver City Bus, and West Hollywood City Line/Dayline would be affected by construction. Pedestrian and bicycle movements could be affected at bus stops, street crossings, and along portions of streets affected by construction.

5.1.8 MOS 1 – Fairfax Station Terminus

Traffic impacts under MOS 1 will involve station locations along Wilshire Boulevard between Western Avenue and Fairfax Avenue, including Crenshaw (optional) and La Brea. Metro bus service pedestrian and bicycle access along Wilshire Boulevard at these station areas would also be affected.

5.1.9 MOS 2 – Century City Station Terminus

Traffic impacts under MOS 2 will involve station locations identified in Section 5.1.6 plus station areas in the vicinity of La Cienega Boulevard, Rodeo Drive, and Century City. Traffic impacts primarily invoke Wilshire Boulevard, but, depending on the selected station in Century City, impacts could also include Santa Monica Boulevard. Construction impacts would affect Metro bus service on Wilshire Boulevard and potentially Santa Monica Boulevard. Pedestrian and bicycle movements could be affected at bus stops, street crossings, and along portions of streets affected by construction.

5.2 Air Quality

This section presents methodology and preliminary calculations for determining potential emissions, gas, and odor impacts related to tunneling in Known gassy or potentially gassy areas. The analysis is based on existing available data and information from other projects constructed in the project area. The analysis focuses on potential air emissions and odors associated with gas releases along the alignment between the Wilshire/Western and Wilshire/La Cienega Stations. Air pollutant emissions from construction activity include those associated with the slurry treatment plant, tunneling, removal, and transport of soils for disposal, station construction, and workers' travel.

"Air Pollution" is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, and/or reducing human or animal health. Air quality is a term used to describe the amount of air pollution the public is exposed to.

Air quality in the United States is governed by the Federal Clean Air Act (CAA) and is administered by the U.S. Environmental Protection Agency (USEPA). In addition to being subject to the requirements of the CAA, air quality in California is also governed under the California Clean Air Act (CCAA).

The CCAA, as amended in 1992, requires all air districts in the State to endeavor to achieve and maintain State Ambient Air Quality Standards. The California Air Resources Board (CARB) administers the CCAA statewide. A brief description of these and other involved agencies are described below, as is the CAA.

5.2.1 U.S. Environmental Protection Agency

The USEPA is responsible for establishing the National Ambient Air Quality Standards and enforcing the Clean Air Act, and regulates emission sources, such as aircraft, ships, and certain types of locomotives, under the exclusive authority of the federal government. The USEPA also has jurisdiction over emission sources outside state waters (e.g., beyond the outer continental shelf) and establishes various emission standards, including those for vehicles sold in states other than California. Automobiles sold in California must meet the stricter emission standards established by CARB. For additional information about the USEPA, the reader can contact its general internet address found at www.epa.gov. Additional information on the activities of USEPA Region IX, which includes California, can be found at www.epa.gov/region9. Finally, additional information on the activities of USEPA's Office of Mobile Sources can be found at www.epa.gov/omswww/mshome.htm.

5.2.2 California Air Resources Board

CARB, which became part of the California Environmental Protection Agency (CalEPA) in 1991, is responsible for ensuring implementation of the CCAA, meeting state requirements of the CAA, and establishing State Ambient Air Quality Standards. It is also responsible for setting emission standards for vehicles sold in California and for other emission sources such as consumer products and certain off-road equipment. CARB also established passenger vehicle fuel specifications. The internet address for CalEPA is www.calepa.cahwet.gov; the address for CARB is www.arb.ca.gov.

CARB also oversees the functions of local air pollution control districts and air quality management districts, which in turn administer air quality activities at the regional and county level. The CCAA is administered by CARB at the state level and by the Air Quality Management Districts at the regional level.

5.2.3 South Coast Air Quality Management District

The South Coast Air Quality Management District (SCAQMD) was created to protect the public from the harmful effects of air pollution, achieve and maintain air quality standards, foster community involvement, and develop and implement cost-effective programs meeting state and federal mandates, considering environmental and economic impacts.

Specifically, the SCAQMD is responsible for monitoring air quality and planning, implementing, and enforcing programs designed to attain and maintain state and federal ambient air quality standards in the district. Programs developed include air quality rules and regulations that regulate stationary source emissions, including area sources and point sources and certain mobile source emissions. The SCAQMD is also responsible for

establishing permitting requirements for stationary sources and ensuring that new, modified, or relocated stationary sources do not create net emissions increases and, therefore, are consistent with the region's air quality goals. The SCAQMD enforces air quality rules and regulations through a variety of means, including inspections, educational or training programs, or fines, when necessary.

5.2.4 Clean Air Act Amendments of 1990

The Clean Air Act Amendments of 1990 (CAAA) direct the USEPA to implement environmental policies and regulations that will ensure acceptable levels of air quality. Under the CAAA, a project cannot:

Cause or contribute to any new violation of any National Ambient Air Quality Standards (NAAQS) in any area

- Increase the frequency or severity of any existing violation of any NAAQS in any area
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area

5.2.5 National and State Ambient Air Quality Standards

As required by the Clean Air Act, NAAQS have been established for six major air pollutants. These pollutants are: carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM10 and PM2.5), sulfur dioxide, and lead. The State of California has also established ambient air quality standards, known as the California Ambient Air Quality Standards (CAAQS). These standards are generally more stringent than the corresponding federal standards and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles.

State and federal standards are summarized in Table 5-2. The "primary" standards have been established to protect the public health. The "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

5.2.6 Existing Conditions

5.2.6.1 Local Meteorology

The surrounding atmosphere is an important element in assessing an area's ambient air quality. The study area is located in the South Coast Air Basin (SCAB), which includes all of Los Angeles and Orange counties, as well as portions of Riverside and San Bernardino counties.

The SCAB is bordered by the Pacific Ocean to the west and the San Bernardino mountains to the east. Prevailing winds in the SCAB are mainly out of the west. These prevailing winds are due to the proximity of the SCAB to the coast and the blocking nature of the San Bernardino Mountains to the east; air masses pushed onshore into the basin are often trapped by the San Bernardino Mountains.

During the summer the SCAB is generally influenced by a Pacific Subtropical High cell that sits off the coast, inhibiting cloud formation and encouraging daytime solar heating. The SCAB is rarely influenced by cold air masses moving south from Canada and Alaska, as

these frontal systems are weak and diffuse by the time they reach the basin. The SCAB is classified as a dry-hot desert climate.

5.2.6.2 Local Monitored Air Quality

The South Coast air pollutant levels are measured at monitoring stations that CARB maintains. The monitoring stations nearest the project study area are located in Los Angeles at Veterans Hospital and North Main Street. The last three years of available monitored data for these locations are summarized in Table 5-3 to illustrate the study area's general air quality trends. Detailed monitored data is located in Appendix A.

Table 5-2: State and Federal Air Quality Standards

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15.0 µg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)	Gas Phase Chemiluminescence	0.053 ppm (100 µg/m^3)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.18 ppm (339 µg/m^3)		0.100 ppm (see footnote 8)	None	
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	—	Ultraviolet Fluorescence	0.030 ppm (80 µg/m^3)	—	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (365 µg/m^3)	—	
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	1 Hour	0.25 ppm (655 µg/m^3)		—	—	—
Lead[9]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Average[10]	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[9]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990 California Air Resources Board (02/16/10)

1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM10, PM2.5, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calender year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact U.S. EPA for further clarification and current federal policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent procedure which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

8. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

9. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

10. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (02/16/10)**

Table 5-3: Air Pollutant Levels at CARB Monitoring Stations Near the Study Area

Air Polluant	Standard/ Exceedance**	Veterans Hospital West Los Angeles			North Main Street Los Angeles		
		2006	2007	2008	2006	2007	2008
Carbon Monoxide (CO)	Year Coverage*	99%	94%	96%	95%	95%	97%
	Max. 1-hour Concentration (ppm)	2.9	2.7	2.7	3.5	3.2	2.9
	Max. 8-hour Concentration (ppm)	2.0	1.96	1.76	2.68	2.15	1.96
	# Days>Federal 1-hour Std. of >35 ppm	0	0	0	0	0	0
	# Days>Federal 8-hour Std. of >9 ppm	0	0	0	0	0	0
	# Days>California 8-hour Std. of >9.0 ppm	0	0	0	0	0	0
Ozone (O3)	Year Coverage*	98%	98%	96%	98%	97%	96%
	Max. 1-hour Concentration (ppm)	0.099	0.117	0.111	0.108	0.115	0.109
	Max. 8-hour Concentration (ppm)	0.074	0.088	0.097	0.079	0.103	0.090
	# Days>Federal 8-hour Std. Of >0.075 ppm	0	2	2	3	3	3
	# Days>California 1-hour Std. Of >0.09 ppm	3	2	3	8	3	3
	# Days>California 8-hour Std. Of >0.07 ppm	2	2	8	7	6	6
Nitrogen Dioxide (NO2)	Year Coverage*	94%	93%	96%	97%	96%	95%
	Max. 1-hour Concentration (ppm)	0.078	0.082	0.090	0.111	0.104	0.122
	Annual Average (ppm)	0.017	0.019	0.018	0.029	0.030	0.027
	# Days>California 1-hour Std. of >0.18 ppm	0	0	0	0	0	0
Sulfur Dioxide (SO2)	Year Coverage*	NM	NM	NM	99%	90%	96%
	Max. 24-hour Concentration (ppm)	NM	NM	NM	0.006	0.005	0.003
	Annual Average (ppm)	NM	NM	NM	0.001	0.000	0.000
	# Days>Federal 24-hour Std. of >0.14 ppm	NM	NM	NM	0	0	0
Suspended Particulates (PM10)	Year Coverage*	NM	NM	NM	95%	93%	79%
	Max. 24-hour Concentration (µg/m3)	NM	NM	NM	59.0	78.0	66.0
	#Days>Fed. 24-hour Std. of>150 µg/m3	NM	NM	NM	0	0	0
	#Days>California 24-hour Std. of>50 µg/m3	NM	NM	NM	3	5	2
	State Annual Average (µg/m3)	NM	NM	NM	30.1	33.0	NA
Suspended Particulates (PM2.5)	Year Coverage*	NM	NM	NM	90%	86%	88%
	Max. 24-hour Concentration (µg/m3)	NM	NM	NM	56.2	64.1	78.3
	State Annual Average (µg/m3)	NM	NM	NM	16.0	NA	16.2
	#Days>Fed. 24-hour Std. of>35 µg/m3	NM	NM	NM	11	20	10
	National Annual Average (µg/m3)	NM	NM	NM	15.5	16.7	15.9
Lead	Maximum Monthly Concentration (µg/m3)	NM	NM	NM	NM	NM	NM
	# Months Exceeding Federal Std.	NM	NM	NM	NM	NM	NM
	# Months Exceeding State Std.	NM	NM	NM	NM	NM	NM
Sulfates	Max. 24-hour Concentration (µg/m3)	NM	NM	NM	NM	NM	NM
	#Samples>California 24-hour Std.>=25 µg/m3	NM	NM	NM	NM	NM	NM

Sources: California Air Resources Board, 2010: http://www.arb.ca.gov/adam/welcome.html. EPA AIRSData (for 1-Hour CO only): http://www.epa.gov/air/data/geosel.html

NM = not measured; NA = not applicable

*Year Coverage indicates how extensive monitoring was during the time of year when high pollutant concentrations were expected.

**The number of days above the standard is not necessarily the number of violations of the standard for the year.

5.2.7 Alternative 1 – Westwood/UCLA Extension

The segment between the Wilshire/Western and Wilshire/La Cienega Stations is located in an area known to have pockets of subterranean methane and hydrogen sulfide gas. The

geotechnical evaluation discussed above, included detailed information on gas concentrations in the project area and potential mitigation measures.

Because of the presence of methane, the City of Los Angeles has implemented special building code provisions for Methane Zones (having more restrictive mitigation requirements) and Methane Buffer Zones (having less restrictive mitigation requirements). Boundaries of the Methane Zone and Methane Buffer Zone within the City of Los Angeles portion of the project area are shown in the Geotechnical and Hazardous Materials Technical Report (Metro, 2010).

As discussed in the Geotechnical and Hazardous Materials Technical Report (Metro, 2010), in some areas of the project corridor near the La Brea tar pits, methane concentrations can be 90 – 100 percent by volume. Methane is a flammable, colorless, odorless gas that is an explosion hazard when mixed with air at concentrations exceeding 5 percent and less than 35 percent. Methane is non-toxic. However, methane can reduce the amount of oxygen in the air necessary to support life. Exposure to oxygen-deficient atmospheres (less than 19.5 percent) may produce dizziness, nausea, vomiting, loss of consciousness, and death. At very low oxygen concentrations (less than 12 percent), unconsciousness and death may occur without warning. It should be noted that before suffocation could occur, the lower flammable limit for methane in the air will have to be exceeded causing both an oxygen-deficient and an explosive atmosphere. Project-related methane impacts will be thoroughly discussed in the hazard analyses during the future conceptual and preliminary engineering phases because methane is mainly an explosive risk.

Methane is also a greenhouse gas that remains in the atmosphere for approximately 9 to 15 years. Methane is over 20 times more effective in trapping heat in the atmosphere than carbon dioxide over a 100-year period. It is emitted from a variety of natural and human-influenced sources, including landfills, natural gas and petroleum systems, agricultural activities, coal mining, stationary and mobile combustion, wastewater treatment, and certain industrial process.

The Geotechnical and Hazardous Materials Technical Report (*Metro, 2010)*, indicates that hydrogen sulfide concentrations can be as high as 1000 parts per million (ppm). One such measurement at this level was taken east of Curson Avenue and Wilshire Boulevard. All other measurements were less than 160 ppm, ranging from not detected (0) to 160 ppm between Wilshire and Western Boulevards and Crescent Heights, at the measurement locations. Hydrogen sulfide is a toxic, flammable, and colorless gas that poses an immediate fire and explosion hazard when mixed with air at concentrations exceeding 4 percent. Hydrogen sulfide has a distinct “rotten-egg” smell. Continuous inhalation of hydrogen sulfide can cause deadening of the sense of smell, dizziness, headache, nausea, and respiratory tract irritation. Because hydrogen sulfide can deaden the sense of smell, odor may not be an effective warning of the presence of hydrogen sulfide. Exposure to hydrogen sulfide concentrations greater than 500 ppm can result in respiratory arrest, coma, unconsciousness, and death. Therefore, avoiding fatal hydrogen sulfide gas concentrations will be the primary project-related safety issue.

Preliminary safety procedures related to hydrogen sulfide gas follow the Cal/OSHA procedures described in Section 4.0.

5.2.8 Alternative 2 – Westwood/VA Hospital Extension

Existing conditions for Alternative 2 are the same as Alternative 1. (Refer to Section 5.2.2 Alternative 1 – Westwood/UCLA Extension).

5.2.9 Alternative 3 – Santa Monica Extension

Existing conditions for Alternative 3 are the same as Alternative 1. (Refer to Section 5.2.2 Alternative 1 – Westwood/UCLA Extension).

5.2.10 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

Existing conditions for Alternative 4 are the same as Alternative 1. (Refer to Section 5.2.2 Alternative 1 – Westwood/UCLA Extension).

5.2.11 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

Existing conditions for Alternative 5 are the same as Alternative 1. (Refer to Section 5.2.2 Alternative 1 – Westwood/UCLA Extension).

5.2.12 MOS 1 – Fairfax Station Terminus

Existing conditions for MOS 1 are the same as Alternative 1. (Refer to Section 5.2.2 Alternative 1 – Westwood/UCLA Extension).

5.2.13 MOS 2 – Century City Station Terminus

Existing conditions for MOS 2 are the same as Alternative 1. (Refer to Section 5.2.2 Alternative 1 – Westwood/UCLA Extension).

5.2.14 Maintenance and Operation Facility Sites

Existing conditions for Maintenance and Operation Facility Sites are the same as Alternative 1. (Refer to Section 5.2.2 Alternative 1 – Westwood/UCLA Extension).

5.3 Noise and Vibration

5.3.1 Existing Conditions – Noise Environment

The project alignment is located within the urbanized sections of four cities: Beverly Hills, Los Angeles, West Hollywood, and Santa Monica. The acoustical environment of these urban areas is dominated by typical urban noise sources, such as roadway traffic, aircraft, and activities on commercial and industrial land uses. Existing noise levels along the route are described in the Noise and Vibration Technical Report (Metro, 2010). The noise elements of three of the four communities through which this project is proposed to travel contain additional information regarding the existing levels of noise in the area. This information is summarized below.

The noise contours for the City of Beverly Hills are presented in Figure 5-1. This exhibit presents the 60 dBA, 65 dBA, and 70 dBA CNEL noise levels from the primary arterials within the City for the year 2005. The noise contours for the City of Santa Monica are presented in Figure 5-2. This exhibit presents the 60 dBA and 65 dBA CNEL noise levels from the primary arterials within the City for the year 2000.

The City of Los Angeles' noise ordinance contains a table that lists the ambient noise levels presumed for several land use zones for both the daytime and nighttime hours of the day. These noise levels are presented in Table 5-4. Additional noise levels presented in Figure 5-3 show a noise thermometer of typical environmental noise levels for both the exterior and interior noise sources.

Table 5-4: City of Los Angeles Presumed Ambient Noise Levels

	Presumed Noise Levels (dBA, Leq)	
Land Use Zone	Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
Residential	50	40
Commercial	60	55
Light Industrial	65	65
Heavy Industrial	70	70

Source: Los Angeles Municipal Code, Chapter 11, Section 111.02

Based on the above table and other measurements of existing conditions along the route,[27] the urban environment in the project area experiences noise levels ranging from 60 to 70 dBA CNEL. It is expected that the majority of the properties along project alignment currently experience ambient noise levels within this range. The less urban areas that are further away from the primary roadways along the alignment will experience lower levels than those shown, with a typical reduction of 3 dB per doubling of distance due to geometric spreading of acoustical energy. The areas closest to the busiest intersections will experience noise levels greater than those shown.

[27] See for example Santa Monica, 2004.

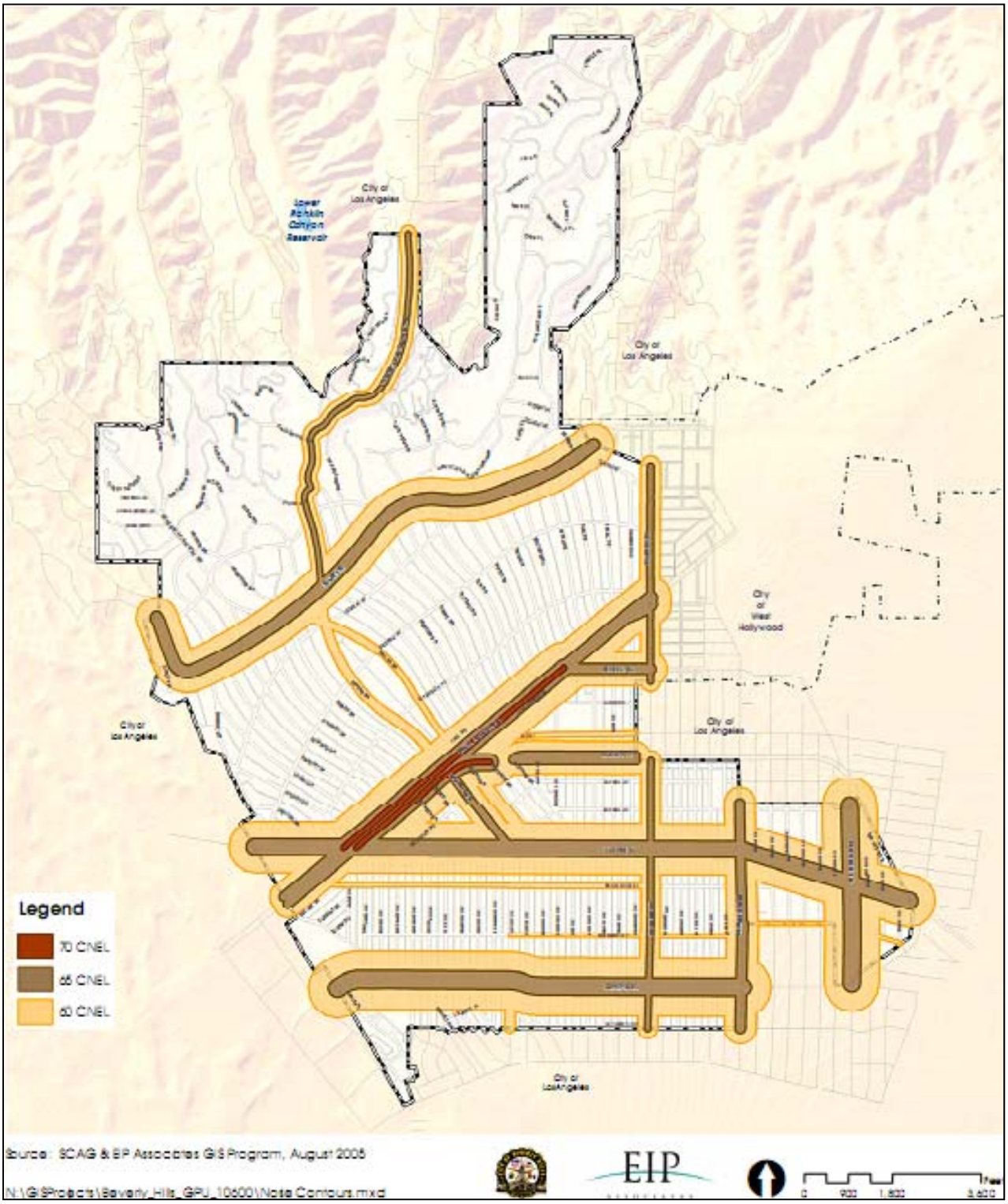


Figure 5-1. City of Beverly Hills – Existing (2005) Roadway Noise Contours

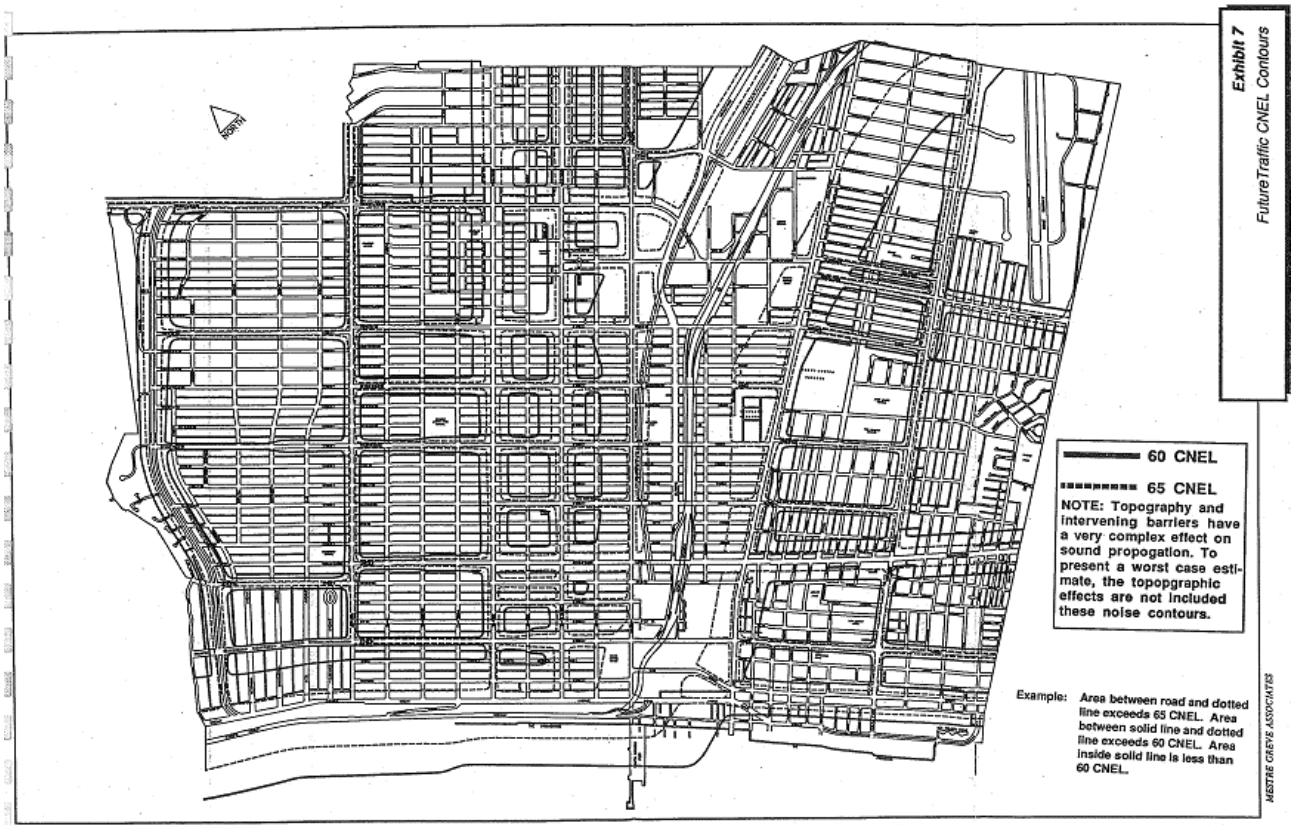


Figure 5-2: City of Santa Monica Future (2000) Roadway Noise

Figure 5-3: Typical Outdoor and Indoor Noise Levels (dBA)

5.3.2 Alternative 1 – Westwood/UCLA Extension

Existing noise levels were measured for this alternative at the following proposed Stations:

- Wilshire/Crenshaw Station—Noise levels were measured for 24 hours at 4100 S. Bronson Avenue on the Southeast corner of Wilshire Avenue and Bronson Avenue. This apartment building is the closest category B land use to the proposed station location. The Los Altos Hotel is located on the Northeast corner of Wilshire Avenue and Bronson Avenue. The remaining land use along the proposed station is office buildings and parking lots. Single-family residential land uses are located behind the office buildings on both side of Wilshire Boulevard. An Ldn of 74 dBA and a peak noise-hour Leq (h) of 74 dBA as measured at this location.
- Wilshire/La Brea Station—Noise levels were measured for 24 hours at 5353 Wilshire Boulevard on the Northwest corner of Wilshire Avenue and Detroit Street. This apartment building is the closest category B land use to the proposed station location. The remaining land use along the proposed station is retail, service stores and parking lots. Single-family residential land uses are located behind the retail and service stores on both side of Wilshire Boulevard. An Ldn of 67 dBA and a peak noise hour Leq (h) of 67 dBA as measured at this location.
- Wilshire/Fairfax Station—Noise levels were measured for 24 hours at 6224 Orange Street in the backyard of the apartment building with a direct line of sight to Wilshire Avenue and the proposed station. Residential land uses on Orange Street are the closest category B land use to the proposed station location. The first row land use along the proposed station is retail, service stores and parking lots. Single-family residential land uses are located behind the retail and service stores on both side of Wilshire Boulevard. An Ldn of 76 dBA and a peak noise hour Leq (h) of 73 dBA as measured at this location.
- Wilshire/La Cienega Station—Noise levels were measured for 24 hours at 8601 Wilshire Avenue on the 11th floor sundeck of the apartment building. This is the only category B land use along proposed station location. The first row land use along the proposed station is retail, two restaurants, one movie theatre, one gas station, and office buildings. Single-family residential land uses are located in behind the first row land uses on both side of Wilshire Boulevard. An Ldn of 71 dBA and a peak noise hour Leq (h) of 78 dBA as measured at this location.
- Wilshire/ Rodeo Station—Noise levels were measured for 24 hours at 120 Canon Drive south of Wilshire Boulevard. This is located in the behind the retail and office buildings that front the proposed station location. The first row land use along the proposed station is retail and office buildings. Single-family residential land uses are located behind the first row land uses to the south of Wilshire Boulevard; one hotel and an apartment are located north of Wilshire Boulevard, behind the retail and office land uses. A Ldn of 64 dBA and a peak noise hour Leq (h) of 66 dBA as measured at this location.
- Century City (Santa Monica Blvd)—Noise levels were measured for 24 hours at 1743 Club View Drive north of Santa Monica Boulevard. This is located in the behind the retail and office buildings that front the proposed station location. The first row land use along the proposed station is retail and office buildings south of Santa Monica Boulevard. Los Angeles County Golf Club and retail stores are located north of the proposed station location. Single-family residential land uses are located in behind the

first row land uses to the north of Santa Monica Boulevard. South of the proposed station location the land uses in retail and office space. An Ldn of 63 dBA and a peak noise hour Leq (h) of 65 dBA as measured at this location.

- Westwood/UCLA Off-Street Station—Noise levels were measured for 24 hours north east corner at the intersection of Wilshire Boulevard and Veteran Avenue. The Veteran National Cemetery in located on the northwest corner of Wilshire Boulevard and Veteran Avenue. All other land use in the area in offices and retail stores. An Ldn of 74 dBA and a peak noise hour Leq (h) of 79 dBA as measured at this location.
- Westwood/UCLA Crossover and Tail Track—Noise levels were measured for 15 minutes in front of the Veteran Administration Hospital and compared to the 24-hour levels measured at for the Westwood/UCLA Off-Street Station. The area contains green space, a surface parking lot, and the VA Hospital. An Ldn of 60 dBA and a peak noise hour Leq (h) of 64 dBA as calculated at this location.

5.3.3 Alternative 2 – Westwood/VA Hospital Extension

In addition to the noise measurements at the stations for Alternative 1, additional existing noise levels were measured for this alternative at the following proposed station:
Westwood/VA Hospital Station—Noise levels were measured for 15 minutes in front of the Veteran Administration Hospital and compared to the 24-hour levels measured at for the Westwood/UCLA Off-Street Station. The area contains green space, a surface parking lot, and the VA Hospital. An Ldn of 60 dBA and a peak noise hour Leq (h) of 64 dBA as calculated at this location.

5.3.4 Alternative 3 – Santa Monica Extension

In addition to the noise measurements at the stations for Alternative 1 and Alternative 2, additional existing noise levels were measured for this alternative at the following proposed stations:

Wilshire/Bundy Station—Noise levels were measured for 24 hours at 1224 Saltair Avenue south of Wilshire Boulevard. This is located in the behind the retail and office buildings that front the proposed station location. The first row land use along the proposed station is retail and office buildings. Single-family residential land uses are located in behind the first row land uses on both sides of Wilshire Boulevard, one hotel are located north of Wilshire Boulevard. An Ldn of 65 dBA and a peak noise hour Leq (h) of 67 dBA as measured at this location.

Wilshire/26th Station—Noise levels were measured for 24 hours at 1138 26th Street north of Wilshire Boulevard. This is located in the behind the gas station that front the proposed station location. The first row land use along the proposed station is retail buildings. Single-family residential land uses are located in behind the first row land uses on both sides of Wilshire Boulevard; a park is located to the north of Wilshire Boulevard, west of 25th Street. An Ldn of 70 dBA and a peak noise hour Leq (h) of 69 dBA as measured at this location.

Wilshire/16th Station—Noise levels were measured for 24 hours at 1142 16th Street north of Wilshire Boulevard. This is located in the behind the retail and office buildings that front the proposed station location. The first row land use along the proposed station is retail buildings. Single-family residential land uses are located in behind the first row land uses on

both sides of Wilshire Boulevard. An Ldn of 62 dBA and a peak noise hour Leq (h) of 61 dBA as measured at this location.

Wilshire/4th Station—Noise levels were measured for 24 hours at 1122 4th Street north of Wilshire Boulevard. This is located in the behind the retail and office buildings that front the proposed station location. The first row land use along the proposed station is retail buildings. Single-family residential land uses are located in behind the first row land uses on north sides of Wilshire Boulevard. An Ldn of 69 dBA and a peak noise hour Leq (h) of 67 dBA as measured at this location.

5.3.5 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

In addition to the noise measurements at the stations for Alternative 1 and 2, additional existing noise levels were measured for this alternative at the following proposed stations:

Hollywood/Highland—Noise levels were measured for 24 hours at 6767 Selma Place, east of Highland Avenue, in the second row of apartments behind the retail store that front Highland Avenue. Hollywood High School is located to the west of Highland Avenue. All other land use in the area in offices and retail stores. An Ldn of 69 dBA and a peak noise hour Leq (h) of 67 dBA as measured at this location.

Santa Monica/La Brea Station—Noise levels were measured for 24 hours at 7119 Detroit Street, north of Santa Monica Boulevard. The land uses along the proposed station location is retail, office space and industrial, with apartment south of Santa Monica Boulevard and West of Formosa Avenue. An Ldn of 74 dBA and a peak noise hour Leq (h) of 76 dBA as measured at this location.

Santa Monica/Fairfax Station—Noise levels were measured for 24 hours at 1050 Orange Grove Avenue, the first residential land used behind the commercial land use south of Santa Monica Boulevard. The land uses along the proposed station location is retail, office space and industrial, in front of residential land use on both sides Santa Monica Boulevard. An Ldn of 67 dBA and a peak noise hour Leq (h) of 68 dBA as measured at this location.

Santa Monica/San Vicente Station—Noise levels were measured for 24 hours at 909 Westbourne Drive, apartments located behind the commercial land use north of Santa Monica Boulevard. The land uses along the proposed station location is retail, office space and industrial, in front of residential land use on both sides Santa Monica Boulevard. An Ldn of 68 dBA and a peak noise hour Leq (h) of 65 dBA as measured at this location.

Beverly Center Station—Noise levels were measured for 24 hours at the Westbury Terrace. This is the only residential land use along the proposed station location other land use in the area are parking and retail shops. An Ldn of 73 dBA and a peak noise hour Leq (h) of 70 dBA as measured at this location.

5.3.6 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

Existing noise conditions for this alternative are the same as those described in Sections 5.3.1 through 5.3.4 above.

5.3.7 MOS 1 – Fairfax Station Terminus

For MOS 1, existing noise levels were measured at the following proposed stations: Wilshire/Crenshaw Station, Wilshire/La Brea Station, and Wilshire/Fairfax Station. The noise levels for these stations are described under Alternative 1.

5.3.8 MOS 2 – Century City Station Terminus

For MOS 2, existing noise levels were measured at the following proposed stations: Wilshire/Crenshaw Station, Wilshire/La Brea Station, Wilshire/Fairfax Station, Wilshire/La Cienega Station, Wilshire/ Rodeo Station and Century City (Santa Monica Blvd). The noise levels for these stations are described under Alternative 1.

5.3.9 Station Options

Station Option 5-Westwood/UCLA On-Street Station—Noise levels were measured for 24 hours at the north-east corner of the intersection of Wilshire Boulevard and Veteran Avenue. The Veteran National Cemetery is located on the northwest corner of this intersection. All other land uses in the area are offices and retail stores. An L_{dn} of 74 dBA and a peak noise hour $L_{eq\ (h)}$ of 79 dBA were measured at this location.

Station Option 4-Century City (Constellation) Station—Noise levels were measured for 24 hours at the North-West corner at the intersection of Avenue of the Stars and Constellation Boulevard. A future condominium office is located east of this location and the Hyatt Hotel is located on the south west corner. All other land uses in the area are office buildings. An Ldn of 74 dBA and a peak noise hour Leq (h) of 78 dBA were measured at this location.

5.3.10 Maintenance and Operation Facility Sites

Existing noise conditions for the maintenance and operations facilities are similar to those described in Sections 5.3.1 through 5.3.4 above.

5.3.11 Existing Conditions –Vibration Environment

The project is located in the urban core of the Cities of Los Angeles, West Hollywood, Beverly Hills, and Santa Monica, plus unincorporated portions of Los Angeles County. The existing ground vibration levels are typical of an urban environment, with the background VdB expected to range from 50 to 65 according to the FTA guidance manual (FTA 2006, Figure 7-3).

Additionally, in order to evaluate the vibration levels at the ground surface above the tunnels used by existing, in-service Metro Red Line subway trains, measurements of surface vibration levels were conducted and compiled in a report entitled Westside Extension Transit Corridor Study: Metro Red Line Vibration Study (Metro, 2009). This report is provided in the appendix of this DEIS/EIR. The measurements conducted during that study of areas with similar land use and community activity levels indicate that existing vibration levels at the ground surface typically ranged between 50 and 65 VdB. Some measurement locations immediately adjacent to busy streets yielded slightly higher but not perceptible vibration levels from transit bus and heavy truck pass-bys.

5.4 Utilities

Utility lines are located underneath or immediately adjacent, parallel to and across the roadways in the study area. Utility providers include municipal agencies, special utility districts, and private companies providing electricity, water, wastewater and stormwater collection, natural gas, steam, telecommunications, and cable television services.

5.4.1 Alternative 1 – Westwood/UCLA Extension

5.4.1.1 Electricity, Natural Gas, Steam, Telecommunications, and Cable Television Services

Alternative 1 includes dry utilities that will be impacted by the below structures indentified in Section 5.4 and may require temporary relocation, permanent relocation or protection in place.

5.4.1.2 Wastewater and Stormwater Collection[28]

Under Alternative 1, there are 13 existing storm drains that run underneath the proposed project alignment. A list of major utility providers is shown in Table 5-5.

[28] Westside Subway Extension - Advance Conceptual Engineering Report - Section 4.

Table 5-5: Major Utility Providers

Municipality	Providers
City of Los Angeles	Los Angeles Department of Water and Power Pacific Bell MCI Level 3 Communications Southern California Edison Southern California Gas Company Los Angeles County City Public Works Department , Sanitation Bureau Los Angeles City Public Works Department, Bureau of Street Lighting Los Angeles County Flood District
Los Angeles County	Pacific Bell Southern California Edison California Water Service Los Angeles County Sanitation District Los Angeles County Flood Control District
City of Beverly Hills	Southern California Gas Company Southern California Edison City of Beverly Hills Water Dept. City of Beverly Hills Storm Drain Dept. City of Beverly Hills Waste Water Dept. ATT
City of West Hollywood	MCI Western Union MFS Communications Level 3 Communications Water Storm Drain Waste Water
City of Santa Monica	Southern California Gas Company Southern California Edison Water Dept Storm Drain Dept Waste Water Verizon

5.4.2 Alternative 2 – Westwood/VA Hospital Extension

5.4.2.1 Electricity, Natural Gas, Steam, Telecommunications, and Cable Television Services

Alternative 2 includes dry utilities that will be impacted by the below structures indentified in Section 5.4 and may require temporary relocation, permanent relocation or protection in place.

5.4.2.2 Wastewater and Stormwater Collection

Under Alternative 2, there are 13 existing storm drains that run underneath the proposed project alignment. A list of major utility providers is shown in Table 5-5.

5.4.3 Alternative 3 – Santa Monica Extension

5.4.3.1 Electricity, Natural Gas, Steam, Telecommunications, and Cable Television Services

Alternative 3 includes dry utilities that will be impacted by the below structures indentified in Section 5.4 and may require temporary relocation, permanent relocation or protection in place.

5.4.3.2 Wastewater and Stormwater Collection

Under Alternative 3, 29 existing storm drains run underneath the proposed project alignment. A list of major utility providers is shown in Table 5-5.

5.4.4 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

5.4.4.1 Electricity, Natural Gas, Steam, Telecommunications, and Cable Television Services

Alternative 4 includes dry utilities that will be impacted by the below structures indentified in Section 5.4 and may require temporary relocation, permanent relocation or protection in place.

5.4.4.2 Wastewater and Stormwater Collection

Under Alternative 4, 20 existing storm drains run underneath the proposed project alignment. A list of major utility providers is shown in Table 5-5.

5.4.5 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

5.4.5.1 Electricity, Natural Gas, Steam, Telecommunications, and Cable Television Services

Alternative 5 includes dry utilities that will be impacted by the below structures indentified in Section 5.4 and may require temporary relocation, permanent relocation or protection in place.

5.4.5.2 Wastewater and Stormwater Collection

There are 36 existing storm drains that run underneath the proposed project alignment. A list of major utility providers is shown in Table 5-5.

5.4.6 MOS 1 – Fairfax Station Terminus

5.4.6.1 Electricity, Natural Gas, Steam, Telecommunications, and Cable Television Services

MOS 1 includes dry utilities that will be impacted by the below structures indentified in Section 5.4 and may require temporary relocation, permanent relocation or protection in place.

5.4.6.2 Wastewater and Stormwater Collection

Under the MOS-1 Fairfax Station Terminus, there are 5 existing storm drains that run underneath the proposed project alignment. A list of major utility providers is shown in Table 5-5.

5.4.7 MOS 2 – Century City Station Terminus

5.4.7.1 Electricity, Natural Gas, Steam, Telecommunications, and Cable Television Services

MOS 2 includes dry utilities that will be impacted by the below structures indentified in Section 5.4 and may require temporary relocation, permanent relocation or protection in place.

5.4.7.2 Wastewater and Stormwater Collection

A list of major utility providers is shown in Table 5-5.

5.4.8 Maintenance and Operation Facility Sites

There are two Maintenance and Operations Facility Sites under consideration for the Westside Subway Extension. One site is located south of the existing Metro Purple Line/Red Line facilities between the 4th and 6th Streets Bridges along Santa Fe Avenue.

The second site includes the construction of new heavy rail yard leads from the existing Metro Purple Line/Red Line facilities along an existing rail corridor on the west bank of Los Angeles River to the Union Pacific Los Angeles Transportation Central Rail Yard located north of Metro's Central Maintenance Facility on the east side of Los Angeles River.

Utility impacts for the two Maintenance and Operations Facilities have not been identified but are not expected to be significant and will be addressed in a subsequent phase of the project.

5.5 Business Disruption

For the purpose of this evaluation of potential business disruption impacts, the affected environment is limited to the areas within one-block on either side of the alignment and in particular, the station construction areas. Information regarding business property Full Takes, Partial Takes, Permanent Easements, Temporary Construction Easements, and Permanent Underground Easements required for the project was obtained from the Real Estate-Acquisitions Technical Report (Metro, 2010). Information regarding land uses surrounding stations was obtained from the Task 14.1.02.1 Draft Land Use and Development Opportunities Report. Information regarding economic and fiscal analysis for the metropolitan area of Los Angeles was obtained from the Economic and Fiscal Impact Analysis and Mitigation Report (Metro, 2010). Table 5-6 summarizes the existing land uses (including commercial and business areas) around the proposed station areas of Alternatives 1 though 5 and MOS 1 and 2. Surrounding land uses listed are the uses that are within ¼-mile of the potential station locations, while adjacent uses are those uses located in the immediate vicinity of the station area.

Table 5-6: Existing Land Uses at Potential Station Locations

Alternative	Potential Station Location	Adjacent Land Uses	Surrounding Land Uses
1, 2, 3, 4, 5 MOS 1, 2	Wilshire Boulevard/Crenshaw Boulevard	Office, Vacant, Parking Lots, Commercial, Single- and Multi-Family Residential	Commercial, Institutional, Hotel, Vacant, Single- and Multi-Family Residential
1, 2, 3, 4, 5 MOS 1, 2	Wilshire Boulevard/La Brea Avenue	Office, Bank, Storefront Retail, Government, Church, Multi-family Residential, Parking Lots	Commercial, Institutional, Single- and Multi-Family Residential
1, 2, 3, 4, 5 MOS 1, 2	Wilshire Boulevard/Fairfax Avenue	Office, Museums, Restaurant, Storefront Retail, Multi-Family Residential	Commercial, Institutional, Open Space, Single- and Multi-Family Residential
1, 2, 3, 4, 5 MOS 2	Wilshire Boulevard/La Cienega Avenue	Office, Restaurant, Medical, Theater, Commercial, Multi-Family Residential	Commercial, Office, Single- and Multi-Family Residential, Open Space
1, 2, 3, 4, 5 MOS 2	Wilshire Boulevard/Rodeo Dr	Office, Commercial, Bank, Gallery Multi-Family Residential	Commercial, Parking Lot, Hotel, Office, Multi-Family Residential
1, 2, 3, 4, 5 MOS 2	Century City	Office, Commercial, Open Space	Commercial, Open Space, Single- and Multi-Family Residential, Institutional
1, 2, 3, 4, 5	Westwood	Office, Storefront Retail, Institutional, Vacant, Parking	Institutional, Commercial, Multi-Family Residential, Open Space
1, 2, 3, 5	Wilshire Boulevard/VA Hospital	Office, Storefront Retail, Strip retail, Service Station	Commercial, Single- and Multi-Family Residential, Institutional
3, 5	Wilshire Boulevard/Bundy Dr	Office, Restaurant, Supermarket, Storefront Retail, Storage	Commercial, Single- and Multi-Family Residential, Fitness, Vacant, Parking, Institutional
3, 5	Wilshire Boulevard/26th Street	Office, Restaurant, Drugstore, Storefront Retail	Commercial, Single- and Multi-Family Residential, Restaurant, Open Space, Institutional
3, 5	Wilshire Boulevard/16th Street	Storefront Retail, Office, Auto Dealership, Medical, Institutional, Multi-Family Residential	Commercial, Institutional, Multi-Family Residential
3, 5	Wilshire Boulevard/4th Street	Office, Storefront Retail, Multi-Family Residential	Commercial, Restaurant, Single- and Multi-Family Residential, and Institutional

Alternative	Potential Station Location	Adjacent Land Uses	Surrounding Land Uses
4, 5	Hollywood Boulevard/Highland Avenue	Regional Shopping Center, Museums, Transportation, Storefront Commercial, Multi-Family Residential, Lodging, Entertainment Venues, Restaurants	Commercial, Institutional, Multi-Family Residential
4, 5	Santa Monica Boulevard/ La Brea Avenue	Shopping Center, Strip Retail, Fast Food Restaurant, Storage, Auto Rental/Repair	Commercial, Industrial/Manufacturing, Multi-Family Residential, Parking, Office
4, 5	Santa Monica Boulevard/Fairfax Avenue	Storefront Retail, Grocery, Institutional, Auto Sales	Commercial, Office, Multi-Family Residential, Institutional, Parking,
4, 5	Santa Monica Boulevard/ San Vicente Boulevard	Office, Storefront Retail Public Facility/Transportation, Open Space	Commercial, Single- and Multi-Family Residential, Open Space, Institutional, Bank, Fitness, Hotel
4, 5	Beverly Center	Regional Shopping Center, Parking, Multi-Family Residential, Medical Center	Commercial, Single- and Multi-Family Residential, Institutional

Source: TAHA, 2010

5.5.1 Alternative 1 – Westwood/UCLA Extension

This alternative extends via subway from the existing Metro Purple Line Wilshire/Western Station to Westwood/UCLA. The current land uses adjacent to the proposed project stations are presented in Table 5-6. Commercial land use within 0.25 mile of stations proposed under Alternative comprises the following percentages, approximately:

- 7 percent of existing land use within 0.25 mile of the proposed Wilshire/Crenshaw Station.
- 20.5 percent of existing land use within 0.25 mile of the proposed Wilshire/La Brea Station.
- 4.7 percent of existing land use within 0.25 mile of the proposed Wilshire/Fairfax Station.
- 11.8 percent of existing land use within 0.25 mile of the proposed Wilshire/La Cienega Station.
- 22 percent of existing land use within 0.25 mile of the proposed Wilshire/Rodeo Station.
- 32 percent of existing land use within 0.25 mile of the proposed Century City.
- 8.8 percent of existing land use within 0.25 mile of the proposed Wilshire/Westwood Station.

5.5.2 Alternative 2 – Westwood/VA Hospital Extension

This alternative would follow the same alignment as Alternative 1 – Westwood/UCLA Extension but would include one additional station at the VA Hospital. The current land uses adjacent to the Alternative 2 proposed project stations are presented in Table 5-6.

In addition to commercial land use described under Alternative 1, commercial land use comprises the following percentages under Alternative 2, approximately:

- 0.5 percent of existing land use within 0.25 mile of the proposed Wilshire/VA Hospital Station.

5.5.3 Alternative 3 – Santa Monica Extension

This alternative would follow the same alignment and have the same stations as Alternative 2 – Westwood/VA Hospital Extension, but would also extend the alignment into the City of Santa Monica and add four additional stations. From the Wilshire/VA Hospital Station, the alignment would be under Wilshire Boulevard until the end of the line at Ocean Avenue. The current land uses adjacent to the Alternative 3 proposed project stations are presented in Table 5-6.

In addition to commercial land use described under Alternatives 1 and 2, commercial land use comprises the following percentages under Alternative 3, approximately:

- 3.6 percent of existing land use within 0.25 mile of the proposed Wilshire/Bundy Station.
- 5.6 percent of existing land use within 0.25 mile of the proposed Wilshire/26th Station.
- 10 percent of existing land use within 0.25 mile of the proposed Wilshire/16th Station.
- 15 percent of existing land use within 0.25 mile of the proposed Wilshire/4th Station.

5.5.4 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

Alternative 4 would follow the same alignment and have the same stations as Alternative 1 – Westwood/UCLA Extension. In addition, this alternative includes the West Hollywood Extension, which extends from the existing Metro Red Line Hollywood/Highland Station. From a new station in this location, this alignment extends southerly, centered under Highland Avenue, and continues south under Highland Avenue to just north of Lexington Avenue where it curves to Santa Monica Boulevard. The alignment continues westerly under the center of Santa Monica Boulevard until just east of the Santa Monica/San Vicente Boulevard intersection where the alignment curves south and is centered under San Vicente Boulevard. From San Vicente Boulevard, the alignment curves south and then southwesterly to cross under La Cienega Boulevard to the Wilshire/La Cienega Station. The current land uses adjacent to the Alternative 4 proposed project stations are presented in Table 5-6. In addition to commercial land use described under Alternative 1, commercial land use comprises the following percentages under Alternative 4, approximately:

- 53 percent of existing land use within 0.25 mile of the proposed Hollywood Highland Station.
- 18 percent of existing land use within 0.25 mile of the proposed Santa Monica/La Brea Station.

- 10 percent of existing land use within 0.25 mile of the proposed Santa Monica/Fairfax Station.
- 3.9 percent of existing land use within 0.25 mile of the proposed Santa Monica/San Vicente Station.
- 16 percent of existing land use within 0.25 mile of the proposed Beverly Center Station.

5.5.5 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

Alternative 5 would follow the same alignment and have the same stations as Alternatives 3 and 4. The current land uses adjacent to the Alternative 5 proposed project stations are presented in Table 5-6.

5.5.6 MOS 1 – Fairfax Station Terminus

The Minimum Operable Segment (MOS 1) – Fairfax Extension Alternative would follow the same alignment as Alternative 1 and terminate at the Wilshire/Fairfax station. The current land uses adjacent to the MOS 1 proposed project stations are presented in Table 5-6.

5.5.7 MOS 2 – Century City Extension

The MOS 2 – Century City Extension would follow the same alignment as MOS 1 and would terminate at the Century City station. The current land uses adjacent to the MOS 2 proposed project stations are presented in Table 5-6.

5.5.8 Maintenance and Operation Facility Sites

The Westside Subway Extension project would require either the expansion of Metro Division 20 Rail Yard or the construction of a new rail yard to house and maintain the rail cars. The current land uses adjacent to the proposed project alignments are presented in detail in the Land Use Technical Report.

6.0 ENVIRONMENTAL CONSEQUENCES

Potential impact are analyzed using a reasonable worst-case approach to describe the potential impacts. For example, several possible construction staging areas may be analyzed, even though not all of them would be used. Analyzing potential "maximum impact," also allows the environmental process to identify potential constraints and mitigation. Only one portal is currently envisioned for most stations and therefore, station area displacements and construction impacts related to station entrances would be less than shown, depending upon the portal site selection. Construction staging areas would generally be located on the site selected for the future portal.

6.1 Traffic, Parking, and Transit Impacts

In this section, estimated potential adverse impacts are described under each build alternative as well as the two MOSs. The proposed construction staging scenarios for the Westside Subway Extension Project will determine transportation-related construction impacts. These staging scenarios are further described in Traffic Handling and Construction Staging Report (Metro, 2010). The construction sequences described below reflect an initial identification of potential tunnel drive directions and sequences. There are several possibilities for tunneling and other more advantageous approaches will likely develop as the alignments, crossover locations, alternate station locations, and availability of long-term tunneling sites become better defined.

For each MOS and alignment alternative, estimated traffic-related impacts associated with contractor work and storage area, mining entry/exit locations and TBM operations, and truck haul routes are presented below. Information is also presented on traffic impacts associated with other construction elements, including vertical shafts, drop holes, grouting, and station portals. Designated haul routes will be identified during the final design phase of the project. These routes would be located in a manner that will minimize noise, vibration, and other possible impacts to adjacent businesses and neighborhoods. Following completion of the project, if slight physical damage to haul routes is found, any affected roads would be treated accordingly.

6.1.1 Traffic Lane Requirements

Traffic lane maintenance during construction will follow local agency requirements and standards with respect to lane widths, number of lanes and duration of temporary lane closures. During non-working hours, existing traffic lanes including turn lanes and two-way left turn lanes should be restored to the pre-construction/original condition unless otherwise authorized by the local jurisdiction. Worksite traffic control and construction will be planned to be staged to satisfy the following traffic lane requirements within the traffic control zone, as shown in **Table** 6-1.

6.1.2 Temporary Street Closures and Detour Routes

Traffic handling includes coordination with the impacted local governmental agencies to address the intersections for each station location that would be impacted during construction. These local governmental agencies include Caltrans, the County of Los Angeles, Los Angeles Department of Transportation (LADOT), and the cities of Beverly Hills, West Hollywood, and Santa Monica. Local agency traffic handling requirements and

guidelines are listed in Section 2.1.1 of this document. Coordination and interaction with these agencies will determine which streets can be closed and the detour routes to be used should streets need to be closed for a limited period of time.

Table 6-1: Traffic Lane Requirements During Construction

Station Location	Agency	Street	Traffic Lane(s) Maintained
Wilshire/Crenshaw Station	Los Angeles	Wilshire Blvd.	2 Eastbound
			2 Westbound
Wilshire/La Brea Station	Los Angeles	Wilshire Blvd	2 Eastbound
			2 Westbound
Wilshire/Fairfax Station	Los Angeles	Wilshire Blvd.	2 Eastbound
			2 Westbound
Wilshire/La Cienega Station	Beverly Hills	Wilshire Blvd.	2 Eastbound
			2 Westbound
Connection Structure	Beverly Hills	Wilshire Blvd.	2 Eastbound
			2 Westbound
Wilshire/Rodeo Station	Beverly Hills	Wilshire Blvd.	2 Eastbound
			2 Westbound
Century City Station (Santa Monica Blvd.)	Los Angeles	Santa Monica Blvd.	3 Eastbound
			3 Westbound
Westwood/UCLA Station (Off-Street)	Los Angeles	Wilshire Blvd.	4 Eastbound
			3 Westbound
Wilshire/VA Hospital Station	Los Angeles	Wilshire Blvd.	4 Eastbound
			4 Westbound
Wilshire/Bundy Station	Los Angeles	Wilshire Blvd.	2 Eastbound
			2 Westbound
Wilshire/26th Station	Santa Monica	Wilshire Blvd.	2 Eastbound
			2 Westbound
Wilshire/16th Station	Santa Monica	Wilshire Blvd.	2 Eastbound
			2 Westbound
Wilshire/4th Station	Santa Monica	Wilshire Blvd.	2 Eastbound
			2 Westbound
Highland/Hollywood Station	Los Angeles	Highland Ave.	2 Northbound
			2 Southbound
Santa Monica/La Brea Station	West Hollywood	Santa Monica Blvd.	1 Eastbound
			1 Westbound
Santa Monica/Fairfax Station	West Hollywood	Santa Monica Blvd.	1 Eastbound
			1 Westbound
Santa Monica/San Vicente Station	West Hollywood	Santa Monica Blvd.	2 Eastbound
			2 Westbound
Beverly Center Area Station	Los Angeles	San Vicente Blvd.	2 Northbound
			2 Southbound
Wilshire/La Cienega Station (Option C)	Beverly Hills	Wilshire Blvd.	2 Eastbound
			2 Westbound
Century City Station (Constellation Blvd.)	Los Angeles	Constellation Blvd.	2 Eastbound
			2 Westbound
Westwood/UCLA Station (On-Street)	Los Angeles	Wilshire Blvd.	3 Eastbound
			3 Westbound

The expected year at which construction would take place will be determined so that construction related traffic impacts can be assessed based on the forecasted traffic volumes for that year. As part of the DEIS/EIR, an extensive traffic count program was performed within the study area. This was performed during May 2009 at 184 intersections. This information will be utilized to analyze construction related traffic impacts. These counts and future year traffic projections were used to establish baseline traffic conditions during construction.

6.1.2.1 Closed Streets

Street closures would generally be limited to nighttime, weekend and/or off peak closures. Street closures would be minimized during peak travel periods. Potential street closure locations will be identified in close coordination with the local agencies having jurisdiction. Station decks can be installed and removed with minimal (weekend only) street closures by decking a half street width at a time. But it takes longer and involves a greater duration of traffic disruption than if the street were completely closed for a few days at a time. In recent Metro projects, merchants, community groups, and government agencies have agreed to total street closures to install and remove decks to shorten the overall duration of disruption. A decision of this type will have to be made in cooperation with all affected groups, either during the EIS review process or later.

The current estimate is that construction of a typical station would take 34 to 42 months using cut-and-cover construction methods although the primary impact to traffic is usually associated with the time it takes to install piles and decking for the station box support system. For stations built under existing streets, the top 2 feet of the roadway would be removed and decking would be installed over an approximate 3 to 4 month period. Construction of the station would continue while traffic travels on the decking. This procedure would require partial street closures to install the decking. As partial street closure requirements are identified, traffic would be rerouted to adjacent intersections and the impact of the additional traffic will be determined.

6.1.3 Traffic Circulation Routes

Traffic projections underway for this project will provide information on expected traffic volumes at the intersections to be evaluated. Based on these traffic projections and the proposed construction staging areas, appropriate traffic circulation routes to bypass the area will be developed in conjunction with the local agencies.

6.1.3.1 Traffic Impacts Due to Street Closures and Traffic Diversions

If a street is expected to require closure, the projected traffic would be detoured to other streets in the vicinity of the station and the impacts of the additional traffic will be evaluated to see if mitigations are necessary. Preliminary traffic evaluations were performed at up to four key intersections at each station area, totaling 80 intersections, where diversion of traffic is anticipated due to full street closures during off-peak and night periods. The intersections that are candidates to be evaluated are shown in the following Table 6-2.

Table 6-2: List of Intersections Identified for Evaluation During Construction

Intersections Identified for Evaluation		
1	Western Avenue	Wilshire Boulevard
2	Western Avenue	Olympic Boulevard
A	Western Avenue	6th Street
B	Wilshire Boulevard	Wilton Drive
3	Crenshaw Boulevard	Wilshire Boulevard
4	Crenshaw Boulevard	Olympic Boulevard
5	Lucerne Avenue	Wilshire Boulevard
6	La Brea Avenue	3rd Street
7	La Brea Avenue	Wilshire Boulevard
8	La Brea Avenue	Olympic Boulevard
C	Wilshire Boulevard	Hauser Boulevard
D	Wilshire Boulevard	Highland Avenue
9	San Vicente Boulevard	Olympic Boulevard
10	Fairfax Avenue	Olympic Boulevard
E	Fairfax Avenue	3rd Street
F	Wilshire Boulevard	Fairfax Avenue
11	San Vicente Boulevard	Wilshire Boulevard
12	La Cienega Boulevard	3rd Street
G	Wilshire Boulevard	Robertson Boulevard
H	Wilshire Boulevard	La Cienega Boulevard
13	San Vicente Boulevard/Le Doux Road	Burton Way
14	La Cienega Boulevard	Olympic Boulevard
15	Robertson Boulevard	Burton Way
16	Robertson Boulevard	Olympic Boulevard
17	Beverly Drive	Santa Monica Boulevard
I	Rodeo Drive	Wilshire Boulevard
J	Wilshire Boulevard	Beverly Drive
K	Wilshire Boulevard	Crescent Heights Boulevard
L	Olympic Boulevard	Beverly Drive
18	Bovril Drive	Olympic Boulevard
19	Santa Monica Boulevard	Wilshire Boulevard
20	Beverly Glen Boulevard	Santa Monica Boulevard
21	Beverly Glen Boulevard	Olympic Boulevard
M	Avenue of the Stars	Olympic Boulevard
N	Avenue of the Stars	Santa Monica Boulevard
22	Westwood Boulevard	Wilshire Boulevard
23	Westwood Boulevard	Santa Monica Boulevard
O	Wilshire Boulevard	Gayley Avenue
P	Gayley Avenue	Le Conte Avenue
24	Glendon Avenue	Wilshire Boulevard
Q	Wilshire Boulevard	Federal Avenue
25	Sepulveda Boulevard	Wilshire Boulevard
26	Sepulveda Boulevard	Santa Monica Boulevard
28	Barrington Avenue	Wilshire Boulevard
31	Bundy Drive	Wilshire Boulevard
R	Bundy Drive	Montana Avenue
S	Wilshire Boulevard	Centinela Avenue
32	Bundy Drive	Santa Monica Boulevard
33	26th Street	Wilshire Boulevard

Intersections Identified for Evaluation		
34	26th Street	Santa Monica Boulevard
T	26th Street	Montana Avenue
35	20th Street	Wilshire Boulevard
36	20th Street	Santa Monica Boulevard
37	14th Street	Wilshire Boulevard
38	14th Street	Santa Monica Boulevard
39	Lincoln Boulevard	Wilshire Boulevard
40	Lincoln Boulevard	Santa Monica Boulevard
41	7th Street	Wilshire Boulevard
42	7th Street	Santa Monica Boulevard
43	4th Street	California Avenue
44	4th Street	Wilshire Boulevard
45	4th Street	Santa Monica Boulevard
46	Ocean Avenue	California Avenue/California Incline
47	Ocean Avenue	Wilshire Boulevard
48	Ocean Avenue	Santa Monica Boulevard
49	Highland Avenue	Hollywood Boulevard
50	Highland Avenue	Sunset Boulevard
U	Highland Avenue	Franklin Avenue
V	Hollywood Boulevard	Cahuenga Boulevard
51	Highland Avenue	Santa Monica Boulevard
52	La Brea Avenue	Hollywood Boulevard
53	La Brea Avenue	Sunset Boulevard
54	La Brea Avenue	Santa Monica Boulevard
W	Santa Monica Boulevard	Martel Avenue
55	La Brea Avenue	Melrose Avenue
56	Fairfax Avenue	Sunset Boulevard
57	Fairfax Avenue	Santa Monica Boulevard
58	Fairfax Avenue	Melrose Avenue
59	Crescent Heights Boulevard	Santa Monica Boulevard
60	La Cienega Boulevard	Sunset Boulevard
61	La Cienega Boulevard	Santa Monica Boulevard
62	La Cienega Boulevard	Melrose Avenue
63	La Cienega Boulevard	Beverly Drive
X	San Vicente Boulevard	3rd Street
Y	La Cienega Boulevard	3rd Street
Z	Robertson Boulevard	3rd Street
AA	Burton Way	Robertson Boulevard
AB	Burton Way/San Vicente Boulevard	La Cienega Boulevard
64	San Vicente Boulevard	Beverly Drive
65	San Vicente Boulevard	Santa Monica Boulevard
66	San Vicente Boulevard	Melrose Avenue
67	San Vicente Boulevard	Sunset Boulevard
68	San Vicente Boulevard	Cynthia Street
69	Robertson Boulevard	Santa Monica Boulevard
70	Robertson Boulevard	Beverly Boulevard

6.1.4 Temporary Traffic Signal Plans

Temporary traffic signal plans are required when:

- Traffic signal equipment is temporarily relocated due to construction
- Traffic signal operation is modified to facilitate construction
- Existing intersection lane configuration is changed
- Visibility of traffic signal equipment is obscured by construction
- As directed by the local agencies having jurisdiction

Temporary traffic signal plans will be prepared by the construction contractor as part of the worksite traffic control plans. The temporary traffic signal locations are shown in Table 6-3. Temporary traffic signal plans must conform to the CA MUTCD and applicable local agency standards and guidelines. Within the City of Los Angeles, reference will be made to the City of Los Angeles Special Provisions and Standard Drawings for Installation and Modification of Traffic Signals. Plans shall be reviewed and approved by the each responsible agency prior to implementation.

Table 6-3: Temporary Traffic Signal Locations

Station Location	Agency	Intersections
Wilshire/La Brea Station	Los Angeles	Wilshire Blvd./Sycamore Ave.
	Los Angeles	Wilshire Blvd./La Brea Ave.
	Los Angeles	Wilshire Blvd./Detroit St.
	Los Angeles	Wilshire Blvd./Cloverdale Ave.
	Los Angeles	Wilshire Blvd./Cochran Ave.
	Los Angeles	Wilshire Blvd./Dunsmuir Ave.
Wilshire/Fairfax Station	Los Angeles	Wilshire Blvd./Fairfax Ave.
	Los Angeles	Wilshire Blvd./Crescent Heights
Wilshire/La Cienega Station	Beverly Hills	Wilshire Blvd./Gale Dr.
	Beverly Hills	Wilshire Blvd./La Cienega Blvd.
	Beverly Hills	Wilshire Blvd./San Vicente Blvd.
Connection Structure	Beverly Hills	Wilshire Blvd./Willaman Dr.
	Beverly Hills	Wilshire Blvd./Robertson Blvd.
	Beverly Hills	Wilshire Blvd./La Peer Dr.
Wilshire/Rodeo Station	Beverly Hills	Wilshire Blvd./Canon Dr.
	Beverly Hills	Wilshire Blvd./Beverly Dr.
	Beverly Hills	Wilshire Blvd./El Camino Dr.
	Beverly Hills	Wilshire Blvd./Rodeo Dr.
Century City (Santa Monica)Station	Los Angeles	Santa Monica Blvd./Avenue of the Stars
	Los Angeles	Santa Monica Blvd./Century City Mall
	Los Angeles	Wilshire Blvd./Century Park East
Westwood/UCLA Station (Off-Street)	Los Angeles	Wilshire Blvd./Veteran Ave.
Wilshire/VA Hospital Station	Los Angeles	Wilshire Blvd./Brockton Ave.
	Los Angeles	Wilshire Blvd./Bundy Dr.
Wilshire/Bundy Station	Los Angeles	Wilshire Blvd./Brockton Ave.
	Los Angeles	Wilshire Blvd./Bundy Dr.

Station Location	Agency	Intersections
Wilshire/26th Station	Santa Monica	Wilshire Blvd./Princeton St
	Santa Monica	Wilshire Blvd./26th St.
	Santa Monica	Wilshire Blvd./25th St.
	Santa Monica	Wilshire Blvd./Chelsea Ave.
Wilshire/16th Station	Santa Monica	Wilshire Blvd./18th St.
	Santa Monica	Wilshire Blvd./17th St.
	Santa Monica	Wilshire Blvd./16th St.
	Santa Monica	Wilshire Blvd./15th St.
	Santa Monica	Wilshire Blvd./14th St.
Wilshire/4th Station	Santa Monica	Wilshire Blvd./Lincoln Blvd.
	Santa Monica	Wilshire Blvd./7th St.
	Santa Monica	Wilshire Blvd./6th St.
	Santa Monica	Wilshire Blvd./5th St.
	Santa Monica	Wilshire Blvd./4th St.
	Santa Monica	Wilshire Blvd./3rd St.
	Santa Monica	Wilshire Blvd./2nd St.
	Santa Monica	Wilshire Blvd./Ocean Ave.
Highland/Hollywood Station	Los Angeles	Highland Ave./Yucca St.
	Los Angeles	Highland Ave./Selma Pl.
	Los Angeles	Highland Ave./Sunset Blvd.
	Los Angeles	Highland Ave./Leland Way
	Los Angeles	Highland Ave./De Longpre Ave.
Santa Monica/La Brea Station	West Hollywood	Santa Monica Blvd./La Brea Ave.
	West Hollywood	Santa Monica Blvd./Formosa Ave.
Santa Monica/Fairfax Station	West Hollywood	Santa Monica Blvd./Genessee Ave.
	West Hollywood	Santa Monica Blvd./Fairfax Ave.
Santa Monica/San Vicente Station	West Hollywood	Santa Monica Blvd./La Cienega Blvd.
	West Hollywood	Santa Monica Blvd./Westbourne Dr.
	West Hollywood	Santa Monica Blvd./San Vicente Blvd.
Beverly Center Area Station	Los Angeles	San Vicente Blvd./Beverly Blvd.
	Los Angeles	San Vicente Blvd./Gracie Allen Dr.
	Los Angeles	San Vicente Blvd./3rd St.
	Los Angeles	San Vicente Blvd./Burton Way
	Los Angeles	**La Cienega Blvd./3rd St.**
Wilshire/La Cienega Station (Option 3)	Beverly Hills	Wilshire Blvd./Gale Dr.
	Beverly Hills	Wilshire Blvd./La Cienega Blvd.
	Beverly Hills	Wilshire Blvd./Willaman Dr.
Century City (Constellation) Station (Option 4)	Los Angeles	Constellation Blvd./Avenue of the Stars
	Los Angeles	Constellation Blvd./Garden Ln.
	Los Angeles	Constellation Blvd./Century Park East
Westwood/UCLA Station (On-Street) (Option 5)	Los Angeles	Wilshire Blvd./Glendon Ave.
	Los Angeles	Wilshire Blvd./Westwood Blvd.
	Los Angeles	Wilshire Blvd./Midvale Ave.
	Los Angeles	Wilshire Blvd./ Veteran Ave.

6.1.5 Temporary Striping and Signing

Each affected agency will determine the need for temporary striping installation or modifications. Temporary striping would be considered for the following conditions:

- When traffic is to be diverted to the left of an existing centerline for two or more consecutive nights.
- When the work area is adjacent to an intersection and results in a transition within the intersection.
- When there is an unusual situation where traffic and physical conditions, such as speed or restricted visibility, occur
- Temporary signs would be implemented per the approved traffic control plans. Temporary sign devices include:
- Traffic signs (regulatory, warning and guide)
- Changeable message signs
- Arrow panels
- High-level warning devices
- When signs in a traffic control zone conflict with the implemented traffic control, the signs must be covered by the local agency's approved method to avoid confusion to the motorist.
- Temporary striping and signing plans shall be prepared by the construction contractor and approved by the agency having jurisdiction.

6.1.6 Parking Restriction and Parking Meters

When the construction activity impacts the existing on-street parking spaces, parking circulation plans shall be prepared by the construction contractor and approved by the agency having jurisdiction. The parking circulation plan must be coordinated with each impacted property representative.

6.1.7 Parking Conditions

As part of the DEIS/EIR, a parking impact and policy plan was prepared for the project. This will be utilized during the subsequent construction and traffic handling phase of the project. Existing parking meters affected by construction within the traffic control zone shall be removed or covered as directed by the agency having jurisdiction.

6.1.8 Temporary Parking Locations

As part of the DEIS/EIR, a parking impact and policy plan is being prepared for the project. This will be utilized during the stage construction and traffic handling phase of the project. Based on the proposed parking replacement strategy, temporary parking spaces can be considered for the impacted business or residents during construction.

6.1.9 Loading Zones

When the construction activity impacts the curb side passenger loading or commercial loading zones, loading zone circulation plans shall be prepared by the construction

contractor and approved by the agency having jurisdiction. The loading zone plan must be coordinated with each impacted property representative.

When the construction activity impacts the existing newspaper stands, mail boxes, or bus shelters, an arrangement should be made with each impacted owner for relocation or removal.

6.1.10 Bus Stop Locations

Prior to implementation of any temporary street closures or any changes affecting the bus stop locations, the following transit providers will be contacted at least 100 days in advance. Emergency bus stop relocations will require a contractor employee to visit the office of the impacted bus agency to negotiate the needed change and in no event shall less than 14 days notice be provided:

- Metro
- LADOT DASH
- LADOT Commuter Express
- Santa Clarita Transit
- Culver City bus
- West Hollywood CityLine/Dayline
- Santa Monica Big Blue Bus
- Antelope Valley Transportation Authority

See the Transportation Impact Technical Report (Metro, April 2010), for the existing transit operation information and proposed transit mitigations

6.1.11 Pedestrian, Bicycle and Vehicular Access

When the construction activity encroaches into a sidewalk, walkway, or crosswalk area, special consideration must be given to pedestrian safety, and the following items should be considered for pedestrians in a temporary traffic control zone:

- Pedestrians should not be led into conflicts with work site vehicles, equipment, or operations.
- Pedestrians should not be led into conflicts with vehicles moving through or around the work site.
- Pedestrians should be provided with a safe, convenient, and accessible path.

6.1.12 Pedestrian Detours

Access by sidewalks will be maintained on both sides of the street at all Metro Construction sites at all times throughout construction. Access to all businesses for pedestrians will also be maintained at all times without any requirement for the business owners to make such a request.

All temporary sidewalk designs will be submitted to Metro for approval prior to installation. Temporary sidewalks need not be expensive, but they must be well built of approved

material (wood or other), ADA compliant and having a well built cover. No rough edges or damaged wood will be allowed.

When pedestrians are diverted into the street or adjacent to an open trench, K-rail type concrete barriers or other approved barrier types would be used for barricading between pedestrian and vehicular traffic. Sidewalk closures, if necessary, will be approved by the affected agency having jurisdiction and only one side of the street should be closed at a time.

Pedestrian access to each business property would be provided during the essential hours as requested by the property representative. If acceptable alternate access points are provided, the impacted access may be closed.

6.1.13 Bicycle Access

As part of the DEIS/EIR, a preliminary bike lane design analysis was prepared for the project. This information will be utilized during the stage construction and traffic handling phase of the project. The bike lane design analysis will show the existing bike lanes and proposed bike lanes within the vicinity of the project.

During the construction phase, Metro approved bike routes will be maintained past all construction sites, whether via widened sidewalks or signed or striped bike detour routes.

6.1.14 Access and Impacts to Commercial and Business Driveways

When the construction activity impacts the existing business driveways, maintenance of traffic plans would be prepared by the construction contractor showing how vehicular access would be maintained to businesses and approved by the agency having jurisdiction. The construction activity must be coordinated with each impacted property representative.

During construction, driveway entrance and exits would be maintained during essential hours. If acceptable alternate access points (approved by the applicable agency) are provided, the impacted driveway may be closed.

The local agency may restrict the left-turn and/or right-turn vehicular movements entering and/or exiting driveways during construction.

6.1.15 Loss of Public Parking - Station Construction

Station construction under an active thoroughfare necessitates that the station be “decked” over with a supporting steel structure and deck panels. It is not particularly suitable to allow the deck structure to be used for duration parking of public vehicles and thus there will be a loss of normal parking space. In general public parking will spill over onto side streets on a first come basis. This problem will be aggravated by the parking of commuting vehicles for construction personnel. Any way this is looked at, this will present the public with a loss of parking throughout the duration of station construction.

Some mitigation might be attained through designation of a separate parking area for construction personnel possibly with busing provided to and from the work site and perhaps providing a separate additional area for the public to park. This becomes a matter of available space which in urban areas is not an easy matter to resolve.

6.1.16 Construction Staging

The evaluation of construction staging is based on the current consideration of the five build alternatives for the Westside Subway Extension as well as two Minimum Operating Segments (MOSs), which could be applicable to any of the five alternatives. Specifically, this concept calls for placing an initial Minimum Operating Segment (MOS-1) into construction and operation as funding becomes available, and then constructing follow-on MOS segments or more extensive construction segments as additional funding is attained.

Though sixteen alignment and six station-location options are still under consideration along the proposed alignment (particularly in the Century City-Westwood area) this write-up assumes that the two MOSs and five alternatives would follow the "Baseline" alignments as shown on the key map drawings C1-100, C2-100, C3-100, C4-100 and C5-100 in Appendix A. Currently, the alignment is subdivided into the following segments:

- Alternative 1: Westwood/UCLA Extension
- Alternative 2: Westwood/VA Hospital Extension
- Alternative 3: Santa Monica Extension
- Alternative 4: Westwood/VA Hospital plus West Hollywood Extension
- Alternative 5: Santa Monica Extension plus West Hollywood Extension
- MOS-1: Wilshire/Western (existing station) to Wilshire/Fairfax Station
- MOS-2: Wilshire/Fairfax Station to Century City Station

The construction sequences described below are an initial look at tunnel drive directions and sequences. There are many possibilities for tunneling and other more advantageous approaches will likely develop as the alignments, crossover locations, alternate station locations, and availability of long-term tunneling sites become better defined.

For each MOS and alignment alternative, contractor work and storage area, mining entry/exit locations and TBM operations, and truck haul routes are discussed below.

Contractor work and storage areas would be necessary for construction of station box excavations, station entrances, crossover boxes, pocket tracks, and ventilation shaft locations. However, the most off-street space is needed for off street stations and entry areas from which mining operations and the insertion/extraction of tunneling boring machines would be conducted. This includes the handling of precast-concrete tunnel segment supply, spoil (excavated materials) disposal, tunnel wastewater removal, power supply and other utilities. It is noted when no alternative exists, intermediate stations (between TBM launch and recovery sites) can be built without construction laydown sites located off the street. However the laydown areas will then have to be placed within the street itself involving the closure of half or more of the street for the duration of construction. This is very disruptive to the community and to be done only when absolutely no alternative exists.

Spoils would be disposed off-site at locations which are usually selected by the construction contractor with the concurrence of applicable authorities based on types of soils involved. However, because all tunneling would be performed with pressure-face tunnel boring machines (TBMs), the spoils must undergo partial treatment (possible drying of EPB-TBM spoil; or de-sanding and other processing of Slurry-TBM spoil), on-site before being loaded

on trucks for off-site disposal. Suitable disposal sites will be identified to ensure the excavated material can be removed and transported to the disposal area in a timely and efficient operation.

6.1.17 Level of Service Thresholds

Please refer to Section 5.1, Affected Environment, Traffic, Parking, and Transit for an explanation of LOS Thresholds.

6.1.18 No Build Alternative

No construction will occur with the No Build Alternative, so no traffic related construction impacts would occur.

6.1.19 Transportation System Management (TSM) Alternative

No construction will occur with the Transportation System Management Alternative, so no traffic related construction impacts would occur.

6.1.20 Alternative 1 – Westwood/UCLA Extension

Station construction on the Westwood/UCLA site off-street in Lot 36 could be accomplished without decking and, if adequate area is available for tunneling operations, tunneling could proceed eastbound. The Westwood/UCLA Station site within Wilshire Boulevard would have more restricted work areas and consideration would be given to driving tunnels to the west from Century City.

The road closure would also impact Metro bus operations on Wilshire Boulevard and other streets as well as transit service operated by UCLA, the Santa Monica Big Blue Bus, DASH, and Culver City Bus. Any road closures should minimize as much as possible impacts on bus service reliability, travel time, and passenger convenience.

Pedestrian and bicycle access in the construction areas could also be affected. This includes street crossings, movements along sidewalks/bike lanes, access to local businesses, and access/waiting involving existing bus zones.

It is expected that truck hauling traffic to and from the Westwood/UCLA Station construction yard would be via Wilshire Boulevard to the I-405 (San Diego) Freeway, heading south, or north. The route might pick up I-10 east via other connecting freeways.

6.1.21 Alternative 2 – Westwood/VA Hospital Extension

If the VA Hospital site is the terminus, the site could be used as a TBM entry station, with mining proceeding eastbound to the Century City Station. Since the VA Hospital station is located on VA property, station excavation could remain open, without the need for temporary decking. While no street closures would be necessary, locating the terminus at the VA site may require (partial) closure of Bonsall Avenue, the Eastbound Bonsall/Wilshire on-ramp, and/or the I-405 on- and off-ramps adjacent to the site. Further traffic control would only be needed for entering and exiting of construction traffic onto adjacent roadways.

The road closure would also impact Metro bus operations on Wilshire Boulevard near the Veterans Hospital as well as in Westwood. The impacts under Alternative 2 would affect Metro bus service on Wilshire Boulevard and other streets as well as transit service operated

by UCLA, the Santa Monica Big Blue Bus, DASH, and Culver City Bus. Any road closures should minimize as much as possible impacts on service reliability, travel time and passenger convenience.

Pedestrian and bicycle access in the construction areas could also be affected. This includes street crossings, movements along sidewalks/bike lanes, access to local businesses, and access/waiting involving existing bus zones.

It is assumed truck haul traffic to and from the construction yard at the Westwood/VA Hospital Station would be via Bonsall Avenue, Wilshire Boulevard and the I-405, San Diego Freeway, heading south, or north. The route might pick up I-10 east via other connecting freeways.

6.1.22 Alternative 3 – Santa Monica Extension

This segment could be mined from the Wilshire/26th Street station proceeding west towards 4th Street and east towards the Westwood/VA Hospital Station or an alternative tunnel site on the U.S. Army Reserve area near Federal Way. Excavation for the Wilshire 26th Street station would require lane channelization in order to install soldier piling and cap beams for support of temporary roadway decking during short term lane closures that would require the roadway to be partially closed. With the approximately 680-foot length of station involved, three partial road closures may be needed in order to assure that Wilshire Boulevard would be restored to normal operations within allotted timeframes.

Mining also could proceed from the Westwood/VA Hospital Station or alternative tunnel site on the U.S. Army Reserve area near Federal Way West about 3.7 miles to 4th Street in Santa Monica. Since the Westwood/VA Hospital Station would be located on VA property, tunneling access shaft could remain open, without the need for temporary decking. In this scenario, no street closures would be necessary at the TBM mining site, and traffic control would only be needed for entering and exiting of construction traffic onto adjacent roadways.

The road closure would impact Metro and Big Blue Bus service bus operations on Wilshire Boulevard. The impacts would also affect Metro bus service on Wilshire Boulevard and other streets as well as transit service operated by UCLA, DASH, the Santa Monica Big Blue Bus, and Culver City Bus. Any road closures should minimize as much as possible impacts on service reliability, travel time and passenger convenience.

Pedestrian and bicycle access in the construction areas could also be affected. This includes street crossings, movements along sidewalks/bike lanes, access to local businesses, and access/waiting involving existing bus zones.

Truck haul access would be via Wilshire from the VA Hospital site to the nearest freeway, I-10, or I-405 south or north. The route could also access I-10 east via other connecting freeways.

6.1.23 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

The Santa Monica/Fairfax Station could be used as the mining station under Alternative 4. Mining operations would proceed from this station east towards the existing station at Hollywood/Highland and south towards the Wilshire/Connection Structure. The

construction worksite for the mining operations is adjacent to North Fairfax Avenue and construction traffic would need to be separated by traffic control measures.

Excavation of the Santa Monica/Fairfax Station would require lane channelization in order to install soldier piling and cap beams for support of temporary roadway decking during short term lane closures that would require the entire roadway to be closed. With the approximately 600-foot length of station involved, three road closures may be needed in order to allow Santa Monica Boulevard to be restored to normal operations within allotted timeframes.

Any road closures would affect Metro bus service on Wilshire Boulevard and other streets as well as transit service operated by UCLA, the Santa Monica Big Blue Bus, DASH, and Culver City Bus. In West Hollywood, the road closure would also impact Metro and West Hollywood City Line/Dayline bus operations on Santa Monica Boulevard. Any road closures should minimize as much as possible impacts on service reliability, travel time and passenger convenience.

Pedestrian and bicycle access in the construction areas could also be affected. This includes street crossings, movements along sidewalks/bike lanes, access to local businesses, and access/waiting involving existing bus zones.

It is assumed that truck haul traffic to and from the West Hollywood Station would use Santa Monica Boulevard to access the nearest freeway, I-101, a distance of approximately 3 miles. Alternatively, the I-10 Freeway might be accessed via Fairfax Avenue, a distance of approximately 4 miles; but, in comparison, this route would have a greater impact to the surrounding community.

6.1.24 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

Alternative 5 incorporates the West Hollywood extension under Alternative 3. Since the segment from the Hollywood/Highland Station to the Wilshire/Connection Structure is identical to that described in Alternative 4, see Section 5.1.4 above for a description of construction-related traffic impacts for this segment.

6.1.25 MOS 1 – Fairfax Station Terminus

Excavation of Wilshire/Fairfax Station would require lane channelization, in order to install soldier piling and cap beams for support of temporary roadway decking during short term road closures. Partial closures allow a part of the roadway to remain open but increases the overall time for full installation of roadway deck.

Given the length of Wilshire/Fairfax Station, approximately 1,050 feet (depending on the final MOS end condition, which may include short tail tracks for safe deceleration behind the station), or an optional double cross over, will need a number of partial road closures. Lane closures for channeling the flow of traffic would use curb side lanes on one or both sides of Wilshire Boulevard. These lanes would be reopened upon completion of decking of the roadway for the entire station. As for temporary closures, Traffic Control Pans approved by LADOT will be prepared prior to start of work.

Any road closures would affect Metro bus service on Wilshire Boulevard and other streets Road closures should minimize as much as possible impacts on service reliability, travel time and passenger convenience.

Pedestrian and bicycle access in the construction areas could also be affected. This includes street crossings, movements along sidewalks/bike lanes, access to local businesses, and access/waiting involving existing bus zones.

It is expected that access to the 150 feet x 1,000 feet construction yard located near the Wilshire/Fairfax Station could follow Wilshire, then La Brea to I-10 or US-101. Alternatively, truck haul route might follow Wilshire to La Cienega to I-10. Traffic control for this work would consist mainly of channelization of construction-related and general-purpose traffic flow. If the Wilshire/Western site is used for the TBM starting location, haul routes would include Wilshire Boulevard to Western Avenue to US-101 (North) or I-5 (South).

6.1.26 MOS 2 – Century City Station Terminus

Station excavation would require lane channelization in order to install soldier piling and cap beams for support of temporary roadway decking during short-term lane closures that may not require the entire roadway to be closed. As many as three lane closures may be needed to assure Santa Monica Boulevard would be restored to normal operations within allotted timeframes. Lane closures for channeling the flow of traffic would be curb-side lanes on either side of Santa Monica Boulevard. These lanes would be re-opened upon completion of the decking of the roadway for the entire station.

Any road closures would affect Metro bus service on Santa Monica Boulevard and other streets. Road closures should minimize as much as possible impacts on service reliability, travel time and passenger convenience.

Pedestrian and bicycle access in construction areas could also be affected. This includes street crossings, movements along sidewalks/bike lanes, access to local businesses, and access/waiting involving existing bus zones.

Access to the Century City Station staging area would be via Santa Monica Boulevard or Olympic Boulevard directly to I-405. A potential Beverly Glen/Wilshire haul route could be impractical due to higher congestion as compared to Santa Monica or Olympic Boulevards. Alternatively, use of Avenue of the Stars or Century Park West to Westbound Pico, then Southbound Overland Avenue to I-10 may be more feasible; however Overland Avenue is narrow and often congested.

6.1.27 Vertical Shafts and Related Surface Openings

Traffic and/or pedestrian controls will be required for construction of ventilation shafts, emergency exit stairs, and other related openings to the ground surface that will be located outside the station box footprint. In general, the procedure for staging this work will be similar to the methods used for the main station box. Typically, these openings will be directly adjacent or very close to the main station excavation and will be constructed concurrently with the station work. Because these excavations are smaller in size and depth to the main station excavation, the duration of this work is relatively short, typically from 3-6 months and up to approximately 12 months. However, because such openings extend further beyond the station area, there will be additional impacts.

Some drop pipes used for tunnel construction generally would be located above the tunnel structure and are used for delivering concrete for tunnel lining. In general, access to the drop pipe would take place during a single work shift. The holes would basically be located away from intersections and likely near the middle of a block face. While use of drop pipes would likely be short-term, perhaps no greater than two weeks, a traffic control plan will be implemented.

Grouting operations may take place away from streets to improve the ground at cross passages and potentially for other immediate concerns where ground improvement becomes necessary. Traffic control for this type of operation is very similar to that used for drop pipes, the main difference being that it will usually be required for more than a shift and may extend into 24 hour-days. Traffic control, though disruptive to the public, is fairly simple to implement.

For work in the street, the operation will typically be sequenced so that existing traffic controls for the station work can be extended. When this extended area affects an intersection, the work in the intersection area will need to be staged so that traffic controls within the intersection are limited to off-peak periods. Often these additional surface openings affect sidewalks, which require temporary diversion of pedestrians. Typically, this work can be done such that a minimum sidewalk width is still provided during daylight hours. Full sidewalk closures, where necessary, would be limited to night and weekend periods.

It should be noted that similar surface openings may be constructed adjacent to midline vent structures, which are remote from station sites. However, in such cases, the methods above would still be applied.

6.1.28 Significance of Impacts

The traffic impacts during construction would be adverse (NEPA) and significant (CEQA).

6.1.29 Cumulative Impacts

The Regional Transportation Plan indicates that the region is expected to grow in both population and vehicle miles traveled (VMT). Development and redevelopment would result in increased traffic congestion, particularly along Wilshire Boulevard, and the major arterials in the project study. The No Build Alternative and TSM Alternative would not affect or contribute to a cumulative effect on traffic circulation or parking during project construction. Construction of the build alternatives would result in the temporary disruption and rerouting of traffic which would contribute to the cumulative increases in congestion in the study area. The study area is heavily developed and built out. Within the proposed corridor there are limited opportunities for off-street parking. For construction near station areas of limited on-street and off-street parking the build alternatives would result in a temporary cumulative adverse impacts where the available parking supply determined for the construction of each station does not meet the demands of the construction workers and displaced business and residential parking.

6.2 Air Quality Impacts

6.2.1 Methodology

An assessment of the air quality construction impacts was conducted as part of the March 2010 Westside Subway Extension Air Quality Technical Report (251A). The assessment utilized CARB's Urban Emissions Model (URBEMIS), the Road Construction Emissions Model, Version 6.3.2 (RCEM) developed by the Sacramento Metropolitan Air Quality Management District (SMAQMD), and the SCAQMD OFFROAD 2007 emission factors. The RCEM model estimates emissions of fugitive dust PM_{10} based on a screening emission factor of 20 pounds per day per acre of unpaved activity, and applies an estimated 50% fugitive dust reduction if the user indicates that water trucks will be used for dust control. SCAQMD OFFROAD2007 was used to develop emission factors from off-road construction equipment. Worker and delivery trip emissions factors were estimated using the EMFAC2007 emission factor model. Using these various data sources, daily construction emission levels were developed. These values were compared to the air quality construction significance thresholds shown in Table 6-4 to determine if the project would meet or exceed these values. As the construction schedule is very preliminary at this time, construction emissions were estimated for each major activity.

Once a detailed construction schedule is developed, a more refined construction analysis will be conducted to determine the air quality impacts of construction.

- Odors—Hydrogen sulfide gas has a distinctive "rotten egg" odor. The typical odor recognition threshold for hydrogen sulfide is 0.0005 parts per million (ppm) by volume. The odor analysis is based on existing information in the Geotechnical and Hazardous Materials Technical Report (Metro, August 2010*),* and the United States Environmental Protection Agency (USEPA) SCREEN3 Model.
- Construction Emissions—The South Coast Air Quality Management District (SCAQMD) is responsible for regulating air quality in the South Coast Air Basin, which includes the project area. SCAQMD methodology and guidelines were utilized to calculate construction emissions for volatile organic compounds (VOC), nitrogen oxides (NO_X), carbon monoxide (CO), sulfur oxides (SO_X), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and particulate matter 10 microns or less in diameter (PM_{10}).
- **Odor Impacts**—The Geotechnical and Hazardous Materials Technical Report (Metro, August 2010) discusses odor and gas issues associated with tunneling and excavating in known gassy or potentially gassy areas, and Section 4.2.1.5 of the Project Description discusses tunnel safety in gassy environments. This section addresses odors associated with hydrogen sulfide gas, as methane in its pure form is odorless. As indicated by the available measurement data, the hydrogen sulfide gas in the area occurs in localized "pockets" rather than in a continuous pattern and thus, the concentrations of the gas vary throughout the area. The odor evaluation presents examples where successful tunneling occurred in gassy areas and provides potential mitigation measures.

Hydrogen sulfide concentrations in the tunnel may be controlled utilizing a combination of techniques, also described in Section 4.0. Given the high potential for "pockets" of hydrogen sulfide in the segment between the Wilshire/Western and Wilshire/La Cienega Stations, it is likely that occasional odors from hydrogen sulfide would be detectable (above the typical odor recognition threshold of 0.0005 ppm) during construction.

Table 6-4: SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds[1]		
Pollutant	**Construction[2]**	**Operation[3]**
Nitrogen Oxides (NOx)	100 lbs/day	55 lbs/day
Volatile Organic Compounds (VOC)	75 lbs/day	55 lbs/day
Respirable Particulate Matter (PM10)	150 lbs/day	150 lbs/day
Fine Particulate Matter (PM2.5)	55 lbs/day	55 lbs/day
Sulfur Oxides (SOx)	150 lbs/day	150 lbs/day
Carbon Monoxide (CO)	550 lbs/day	550 lbs/day
Lead (Pb)	3 lbs/day	3 lbs/day
Carbon Dioxide equivalents (CO25)	Being developed at this time	Being developed at this time
Toxic Air Contaminants (TACs) and Odor Thresholds		
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Cancer Burden > 0.5 excess cancer cases (in areas ≥ 1 in 1 million) Hazard Index ≥ 1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality for Criteria Pollutants[4]		
NO2 1-hour average annual average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.18 ppm (state) 0.03 ppm (state)	
PM10 24-hour average annual average	10.4 µg/m3 (construction)[5] & 2.5 µg/m3 (operation) 1.0 µg/m3	
PM2.5 24-hour average	10.4 µg/m3 (construction)[5] & 2.5 µg/m3 (operation)	
Sulfate 24-hour average	1 µg/m3	
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) 9.0 ppm (state/federal)	

[1]*Source: SCAQMD CEQA Handbook (SCAQMD, Rev. March 2009).*

[2]Construction thresholds apply to both the South Coast Air Basin and Coachella Valley (Salton Sea and Mojave Desert Air Basins).

[3]For Coachella Valley, the mass daily thresholds for operation are the same as the construction thresholds.

[4]Ambient air quality thresholds for criteria pollutants based on SCAQMD Rule 1303, Table A-2 unless otherwise stated.

[5]Ambient air quality threshold based on SCAQMD Rule 403.

KEY: lbs/day = pounds per day
ppm = parts per million
µg/m3 = microgram per cubic meter
≥ = greater than or equal to

6.2.1.1 Gas Impacts

Methane is a hazard in confined spaces. As such, it is essential that tunnel workers be sufficiently protected, and thus detection and monitoring equipment would be required. Fans similar to those used to dilute hydrogen sulfide concentrations would also dilute methane concentrations in the tunnel. Once above-ground, methane dissipates rapidly in the atmosphere and would not be a health hazard.

Previous projects in the Methane Risk Zone have been successfully and safely excavated. Multiple underground parking garages have been constructed in this area. For example, the Los Angeles County Museum of Art built a two-level subterranean parking structure in a Methane Risk Zone. During excavation, hydrogen sulfide (above safe working levels) was encountered on several occasions. Workers donned PPE to protect against exposure during these events. Further investigation of operating underground structures will be undertaken during future design phases to assess effectiveness of barrier systems and detection equipment used.

6.2.1.2 Air Quality Impacts

Slurry Treatment Plant

The tunneling would require approximately 150 pounds of bentonite per one linear foot of the tunnel. Based on two tunneling machines, approximately 100 feet per day would be tunneled, using approximately 15,000 pounds of bentonite. Particulate matter emissions for the slurry treatment plant were calculated based on USEPA AP-42 calculation formulas for materials handling. The slurry treatment plant would include a bag house to collect dust during the mixing process. Bag houses typically filter at least 99% of fine particulate matter. As a result, the slurry treatment plant generates minimal dust emissions.

Tunneling

The tunneling would utilize a Slurry Face Tunnel Boring Machine (SF TBM) in the methane zones. The portion of the tunnel not located in the methane zone could be excavated using an EPB TBM. The SF TBMs use electric power, would be connected to the electric grid, and thus would not generate air emissions. Diesel locomotives would be used in the tunnel to transport workers, pre-cast concrete tunnel liner segments, and other materials to the SF TBM. It was assumed that tunneling activity would utilize two 185-horsepower diesel locomotives typically operating six hours per day. Locomotive emission rates were obtained from the USEPA *Emission Factors for Locomotives* (December 1997) document. Construction activity was assumed to occur in 2012.

Removal and Transport of Soils for Disposal

The tunneling could simultaneously utilize two tunneling machines, each with the capability of tunneling a 21-foot outside diameter for an assumed distance of 50 feet per day. Each tunneling machine would generate approximately 650 CYs of excavated soil per day on average resulting in a total of 1,300 CY per day. Excavated soil would be separated from the slurry and stockpiled on the surface for two to three days. The soil would be hauled to a landfill or other disposal area using trucks that would average approximately 20 CY per load. Thus, approximately 40 to 80 haul truck trips would be generated to remove the excavated material each day for tunnel excavation and 25 to 50 haul truck trips per day for station excavation. The estimated maximum truck trips (including, but not limited to, haul, concrete, and supply trucks) is 135 trucks. Truck emission rates were obtained from the California Air Resources Board's EMFAC2007 Motor Vehicle Emissions Inventory Model. Note that if more than two SF TBMs are used, the amounts of emissions would increase accordingly.

Heavy-duty construction equipment would be used to load the haul trucks. It was assumed that one front-end loader would load one truck in 15 minutes. Three front-end loaders would require approximately 11.25 hours to load haul trucks. Front-end loader emissions were obtained from CARB OFFROAD2007 Emissions Model.

Station Construction

Station construction activities would include demolition (as required at station entrances or other locations), excavation, and station construction. It was assumed that demolition would require two front-end loaders and 25 debris haul truck trips per day. Based on the CARB URBEMIS2007 Transportation and Land Use Program Model, demolition debris haul trucks were assumed to travel 30 miles per round trip.

Stations would be approximately 70 feet wide by 680 feet long and 60 feet deep with approximately 450-ft long platforms. Excavation would occur over an approximately 12-month period and would result in approximately 135,000 cubic yards of excavated soil. It would take 25 to 50 haul truck trips per day to remove the excavated soil over eight months. It was assumed that excavation equipment would include two excavators and two front-end loaders. Based on URBEMIS2007, excavation-related haul trucks were assumed to travel 20 miles per round trip.

Sources of air emissions during station construction would include heavy-duty equipment and heavy-duty truck trips associated with materials delivery. It was assumed that station construction equipment would include simultaneous operation of two front-end loaders, two forklifts, one crane, two pumps, and two miscellaneous pieces of equipment. It was further assumed that daily materials delivery activity would include ten trucks traveling 20 miles per round trip.

Heavy-duty equipment emission rates were obtained from OFFROAD2007 and truck emission rates were obtained from EMFAC2007. It was assumed that heavy-duty equipment would operate for 12 hours per day.

Worker Travel

The construction workers would commute to the site and the associated travel emissions would be a function of vehicle emission rates and commute distances. Vehicle emission rates were obtained from EMFAC2007. It was assumed that worker vehicles would be split equally between light-duty automobiles and light-duty trucks. The worker commute distance of 13.3 miles per one-way trip was obtained from URBEMIS2007.

6.2.2 No Build Alternative

No construction will occur with the No Build Alternative, so no air quality related construction impacts would occur.

6.2.3 Transportation System Management (TSM) Alternative

No construction will occur with the Transportation System Management Alternative, so no air quality related construction impacts would occur.

6.2.4 Alternative 1 – Westwood/UCLA Extension

As shown in Table 6-4, SCAQMD thresholds would be exceeded for NO_x for all station construction (with mining and without mining) and PM_{10} would be exceeded for a typical station with mining. Mitigation measures such as watering, the use of soil stabilizers, etc. could be applied to reduce the predicted PM_{10} levels to below the SCAQMD daily construction threshold levels. NO_x levels would be elevated due partially to the proposed use of diesel locomotives to extract soil during the tunnel boring process. Mitigation measures

could help to reduce these impacts, but it is unlikely, given the current construction plan, that these levels would be below the SCAQMD threshold.

Table 6-5: Estimated Construction Impacts for Stations (lbs/day)

Activity	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$
Typical Station with Mining					
Construction Equipment	69	300	1053	38	37
Dust Generated from Dirt Handling (Excavation, Backfilling, etc.)				231	
Mobile Sources (Deliveries, worker trips, hauling of material, etc.)	3	24	42	2	2
Total	72	324	1095	272	39
SCAQMD Thresholds	75	550	100	150	55
Typical Station with No Mining					
Construction Equipment	16	64	108	5	5
Dust Generated from Dirt Handling (Excavation, Backfilling, etc.)				120	
Mobile Sources (Deliveries, worker trips, hauling of material, etc.)	3	19	33	1	1
Total	19	83	141	126	6
SCAQMD Thresholds	**75**	**550**	**100**	**150**	**55**

Under Alternative 1, seven stations including Wilshire/Crenshaw would be constructed using cut-and-cover construction. The proposed Westwood/UCLA (Off-street) stations would be constructed without decking.

Preliminary estimates of construction emissions are presented in Table 6-5. As shown, the majority of emissions would occur as a result of removal and transport of soils for disposal from tunneling activity.

Hazardous hydrogen sulfide and methane concentrations and hydrogen sulfide odors may be mitigated utilizing various control techniques. Many of these techniques, described above, have previously been successfully utilized to excavate in the Methane Risk Zone and the Methane Buffer Zone. Given the potential for "pockets" of high concentration hydrogen sulfide in the segment between the Wilshire/Western and Wilshire/La Cienega stations, it is likely that odor from hydrogen sulfide would occasionally be detectable by workers and above the typical odor recognition threshold of 0.0005 ppm even after implementation of control techniques. However, because of the tar pits in this area, odors are already often detectable at the ground surface and it is unlikely that the additional hydrogen sulfide emissions would be noticeable.

6.2.5 Alternative 2 – Westwood/VA Hospital Extension

Impacts would be similar to Alternative 1. Under Alternative 2, eight stations would be constructed using cut-and-cover construction (no mining). Two of the proposed stations

would be constructed with decking, Westwood/UCLA (Off-street) and Westwood/VA Hospital..

6.2.6 Alternative 3 – Santa Monica Extension

Impacts would be similar to Alternative 1. Under Alternative 3, twelve stations would be constructed using cut-and-cover construction. Two of the proposed stations would be constructed with decking, Westwood/UCLA (Off-street) and Westwood/VA Hospital. Mining would not be used to construct any stations under Alternative 3.

6.2.7 Alternative 4 – Westwood/VA Hospital Extension plus West Hollywood Extension

Impacts would be similar to Alternative 1. Under Alternative 4, thirteen stations would be constructed using cut-and-cover construction. Two of the proposed stations would be constructed with decking, Westwood/UCLA (Off-street) and Westwood/VA Hospital. Mining would not be used to construct any stations under Alternative 4.

6.2.8 Alternative 5 – Santa Monica Extension plus West Hollywood Extension

Impacts would be similar to Alternative 1. Under Alternative 5, seventeen stations would be constructed using cut-and-cover construction. Two of the proposed stations would be constructed with decking, Westwood/UCLA (Off-street) and Westwood/VA Hospital..

6.2.9 MOS 1 – Fairfax Station Terminus

Impacts would be similar to Alternative 1. Under MOS 1, three stations would be constructed using cut-and-cover construction. None of the proposed stations would be constructed with decking..

Since the Fairfax, and the La Brea, stations are located in known ground that contains hydrocarbon deposits, disturbance of the ground will generate varying degrees of toxic or dangerous gases. Submitted and approved construction techniques will take this into account and the public and construction personnel will be completely protected from harm. In order to perform the work there will be continual monitoring of the air environment and the operations will be altered as required to maintain a safe working atmosphere. There are numerous ways in which this can be accomplished but perseverance is the thing that must prevail.

Once excavation has been completed, though greatly diminished, the potential for developing gas leaks will exist and continuous monitoring will still be necessary. Opening new ground for construction of cross-passageways, shafts, and other structure will bring on new, and perhaps, an even more concentrated exposure. Perseverance in monitoring will alert personnel to alter ventilation, establish collection systems, or perhaps to temporarily evacuate. Emissions of dust and gases from the job site are to be controlled and maintained below acceptable limits. Dust from handling a “wet” slurry is not expected to become a problem, but gases emanating from the slurry treatment plant, if not properly handled, may become an issue requiring modification of equipment and or procedure.

6.2.10 MOS 2 – Century City Station Terminus

Impacts would be similar to Alternative 1 and MOS 1. Under MOS 2, six stations would be constructed using cut-and-cover construction (no mining). None of the proposed stations

would be constructed with decking. Mining would not be used to construct any stations under MOS 2.

6.2.11 Maintenance and Operation Facility Sites

As shown in Table 6-6: Estimated Construction Impacts for Project Maintenance and Operation Facility Sites (lbs/day), SCAQMD thresholds would be exceeded for NO_x for construction of maintenance facility. NO_x levels would be elevated due partially to the proposed use of diesel locomotives to extract soil during the tunnel boring process. Mitigation measures could help to reduce these impacts, but it is unlikely, given the current construction plan, that these levels would be below the SCAQMD threshold.

Table 6-6: Estimated Construction Impacts for Project Maintenance and Operation Facility Sites (lbs/day)

Activity	VOC	CO	NOx	PM10	PM2.5
Maintenance Facility					
Construction Equipment	27	102	228	8	8
Dust Generated from Dirt Handling (Excavation, Backfilling, etc.)				TBD	
Mobile Sources (Deliveries, worker trips, hauling of material, etc.)	3	19	33	1	1
Total	30	121	261	9+	9
SCAQMD Thresholds	75	550	100	150	55

6.2.12 Significance of Impacts

The noise and vibration impacts during construction would be adverse (NEPA) and significant (CEQA).

6.2.13 Cumulative Impacts

Cumulative impacts are impacts on the environment that result from the incremental impact of a project when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR § 1508.7)

CEQA defines cumulative impact as follows:

- Two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts, and
- The change in the environment which results from the incremental impact of the project when added to other closely related past, present, or reasonably foreseeable future projects, and can result from individually minor, but collectively significant, projects taking place over a period of time (CEQA Air Quality Handbook*).*

CEQA has put forth several possible assumptions to determine whether a project is significant enough to warrant a cumulative impact analysis. These include whether the project reduces the rate of growth in VMT, reduces emissions by a certain amount each year,

or increases average vehicle ridership (CEQA Air Quality Handbook). This approach is not mandatory under CEQA, but is a possible way to determine whether a project is significant.

This project is predicted to reduce regional VMT and regional emission burden levels. It is included in the Draft Amendment #08-34 to the 2008 RTIP as Project ID #UT101, #1TR1002 and #1TR1003 (refer to page 5 of Draft Amendment). The Westside Subway Extension is also included in Metro's 2009 LRTP under Candidates for Private Sector Financial Participation – Transit Projects. The plan includes a transportation conformity determination for the entire region, as it accounts for future emissions from all mobile sources and ensures that attainment will not be delayed by future projects.

6.3 Noise and Vibration

This section evaluates the potential construction related noise impacts on sensitive receptors within the study area. Noise around and active construction site will be addressed by the contractor to meet noise control requirements and minimize impacts to the public. Provisions to control noise include providing substantial, sufficiently tall, and attractive sound walls.

Vibration is likely to be of little concern or impact for either station or tunnel excavation. Soldier piles, if used, are to be drilled; a method which does not result in noticeable vibration. Effects of vibration during project operation are discussed in the Noise and Vibration Technical Report (Metro, 2010).

Noise and vibration impacts from construction will vary greatly depending on location. The greatest potential for impacts is in the vicinity of underground stations, tunnel access portals, and construction laydown areas.

Although noise and vibration impacts may occur during all construction phases, the greatest potential for noise and vibration impact occurs during the heavy construction phase. Typical construction equipment noise emission levels are shown in Table 6-1. The values shown in Table 6-1 are representative of noise emissions from typical construction equipment and methods from empirical data obtained during similar construction projects. Precise noise emission levels for the actual equipment to be used on the project are not available at this time.

Noise levels from point source stationary noise sources, such as construction equipment decrease at a rate of 6 dB per doubling of distance. The noise emission levels shown in Table 6-7 are representative of construction noise levels at a distance of 50 feet. A distance of 250 feet from the construction area will be 14 dB less than the values shown in Table 6-7, and noise levels at 500 feet from the source will be 20 dB less that the values shown in Table 6-7.

The sensitive noise receptors for each Alternative are discussed in the following sections. The locations of potential noise and vibration sensitive receptors are shown in the following Westside Subway Extension Sensitive Noise Receptors Figures.

Table 6-7: Noise Level of Typical Construction Equipment at 50 feet (dBA Lmax)*

Construction Equipment	Noise Level at 50 Feet
Auger Drill Rig**	85
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane Derrick	88
Crane Mobile	83
Dozer	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (Impact)	101
Pile Driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifer	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

Sources:
** FTA Manual, Table 12-1, 2006.*
*** FHWA RCNM*

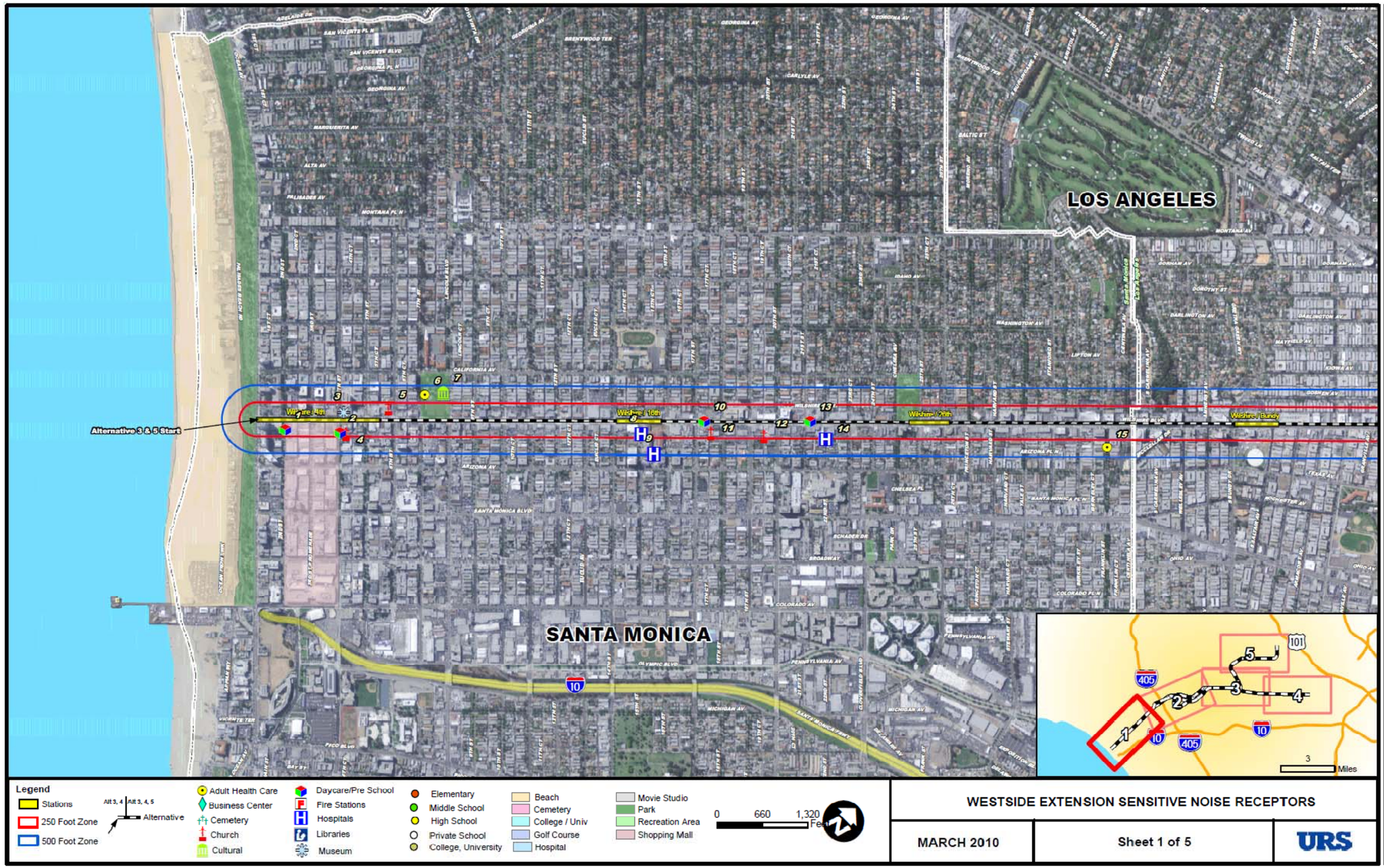
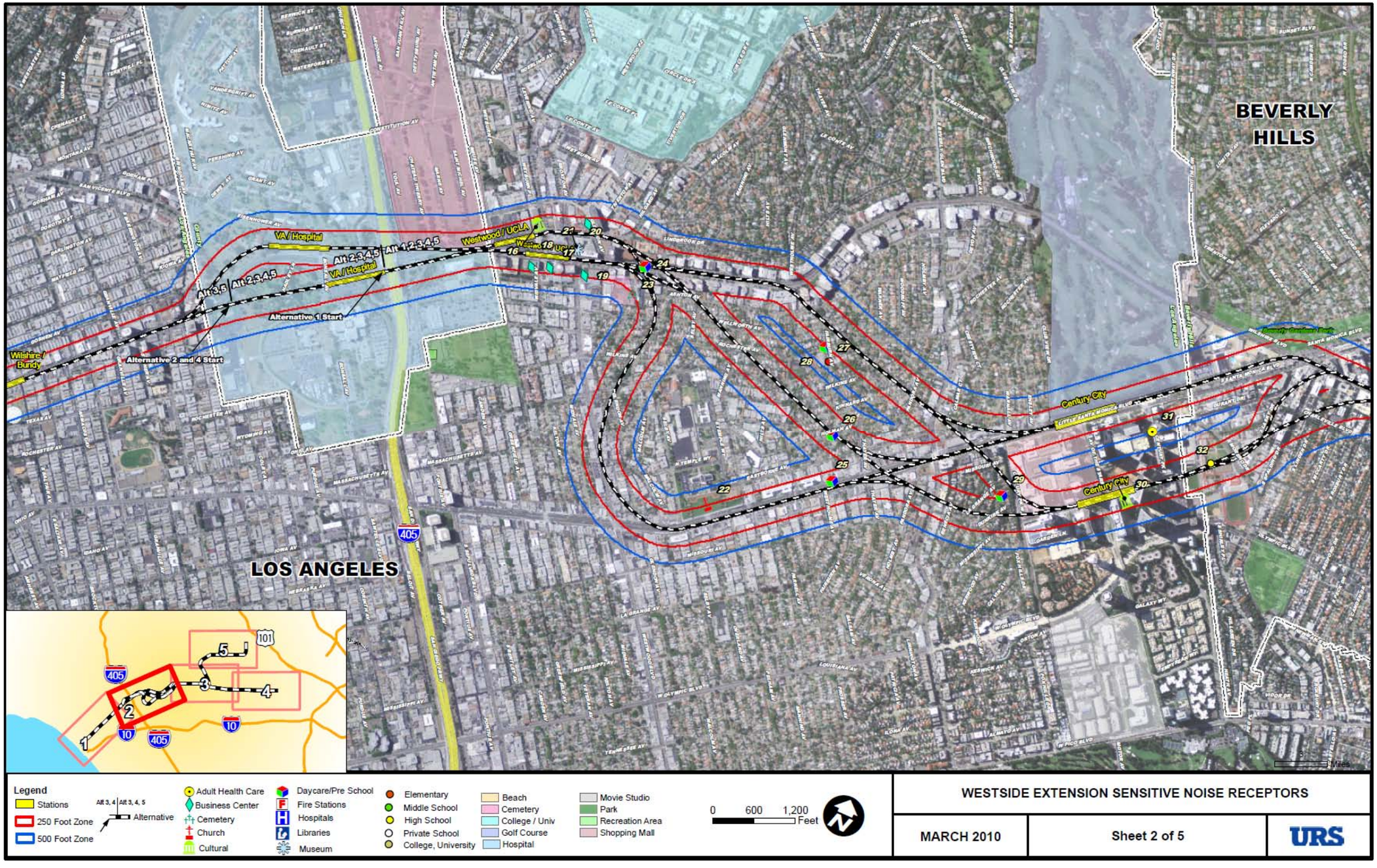


Figure 6-1: Noise Sensitive Receptors


BEVERLY HILLS
LOS ANGELES
Century City
VA / Hospital
Alt 2,3,4,5
Alt 1,2,3,4,5
Alt 3,5
Alt 2,3,4,5
Westwood / UCLA
Alternative 1 Start
Alternative 2 and 4 Start
Wilshire / Bundy
405
10
101
Legend
Stations
250 Foot Zone
500 Foot Zone
Alt 3, 4
Alt 3, 4, 5
Alternative
Adult Health Care
Business Center
Cemetery
Church
Cultural
Daycare/Pre School
Fire Stations
Hospitals
Libraries
Museum
Elementary
Middle School
High School
Private School
College, University
Beach
Cemetery
College / Univ
Golf Course
Hospital
Movie Studio
Park
Recreation Area
Shopping Mall
0 600 1,200 Feet
0 1 Miles
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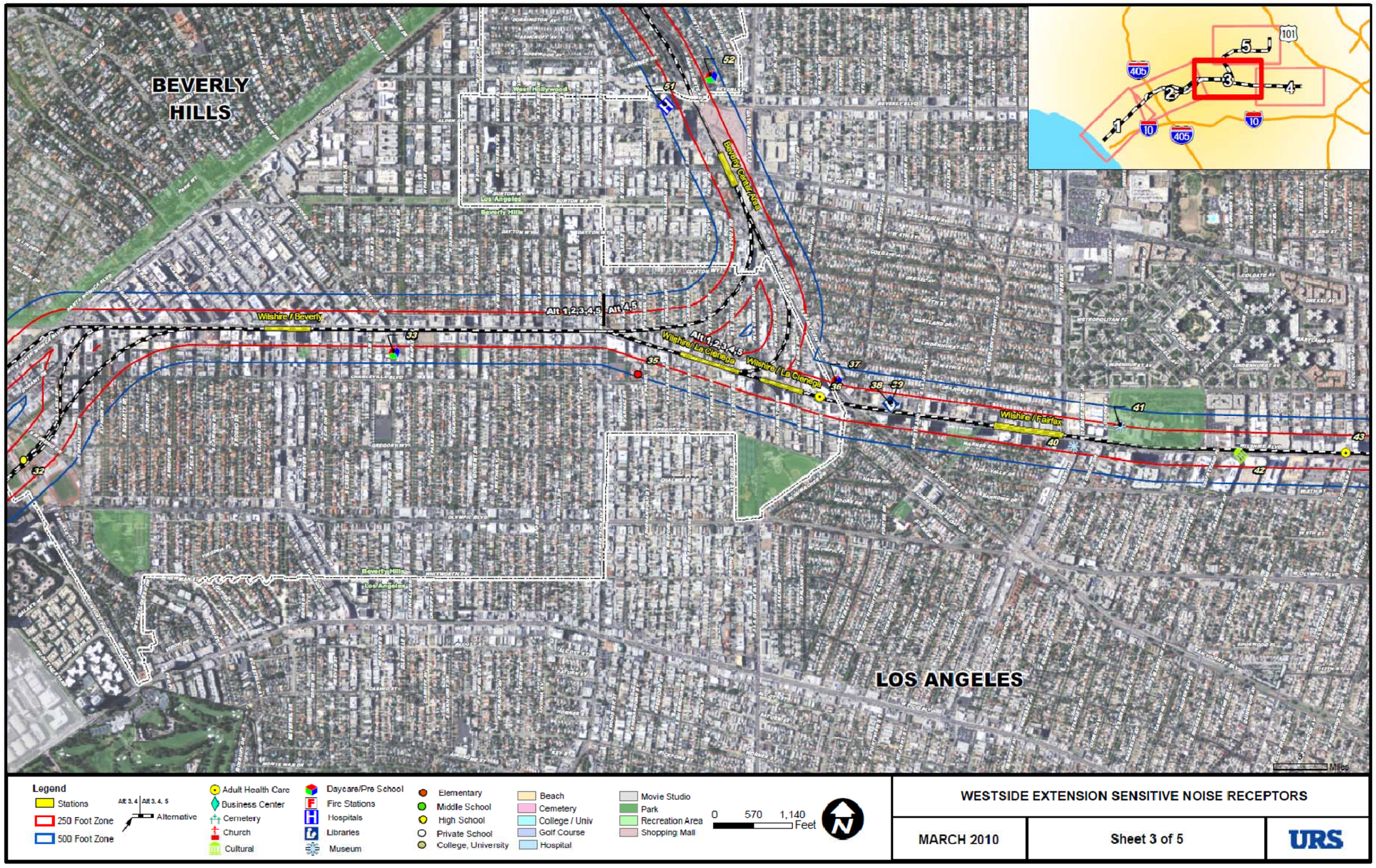
BEVERLY HILLS
West Hollywood
Los Angeles
Beverly Hills
Beverly Center Area
Wilshire / Beverly
Alt 1,2,3,4,5
Alt 4,5
Wilshire / La Cienega
Alt 1,2,3,4,5
Wilshire / La Cienega
Wilshire / Fairfax
LOS ANGELES
Beverly Hills
Los Angeles
32
33
35
36
37
38
39
40
41
42
43
51
52
101
405
10
405
10
1
2
3
4
5
0 1 2 Miles
Legend
Stations
250 Foot Zone
500 Foot Zone
Alt 3, 4
Alt 3, 4, 5
Alternative
Adult Health Care
Business Center
Cemetery
Church
Cultural
Daycare/Pre School
Fire Stations
Hospitals
Libraries
Museum
Elementary
Middle School
High School
Private School
College, University
Beach
Cemetery
College / Univ
Golf Course
Hospital
Movie Studio
Park
Recreation Area
Shopping Mall
0 570 1,140 Feet
N
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